

C 4488(2) LIVERPOOL

PORT OF LIVERPOOL.



ANNUAL REPORT
OF THE
MEDICAL OFFICER OF HEALTH
TO THE
PORT SANITARY AUTHORITY.
FOR THE YEAR

1916.

[ORDERED BY THE PORT SANITARY AND HOSPITALS COMMITTEE TO BE
PRINTED, 19TH APRIL, 1917.]

LIVERPOOL :
C. TINLING AND CO., LTD., PRINTING CONTRACTORS, 53, VICTORIA STREET.

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PORT SANITARY AUTHORITY

OF

LIVERPOOL.

REPORT FOR THE YEAR 1916,

BY THE

MEDICAL OFFICER OF HEALTH.

In accordance with the duty imposed by the Local Government Board in their General Order dated March 23rd, 1891, the following report for the year ending December 31st, 1916, is made to the Liverpool Port Sanitary Authority.

The report covers the operations of the Port Sanitary Authority during the year, which, in spite of war conditions, has been of an extensive and important character.

The work is included under the following headings:—

(a) Measures adopted under the Cholera, Yellow Fever, and Plague and allied orders of the Local Government Board.

(b) Measures taken to ascertain and deal with any infectious disease existing on board vessels entering the Port of Liverpool, or which have occurred during the voyage.

(c) The administration of the Order of the Local Government Board with regard to imported foodstuffs.

(d) Action taken with regard to the sanitation of vessels.

(e) The supervision of the Emigrant traffic as regards disease.

Sanitary Survey.

On November 8th, 9th, and 10th, a Sanitary survey of the Port was held by the Inspectors of the Local Government Board, Dr. Bruce Low

and Dr. Wilkinson. The preliminary enquiry was attended by representatives of the Admiralty, the Port Sanitary Authority, H.M. Customs, the Mersey Docks and Harbour Board, and a representative of the United States Public Health Service, who happened to be visiting the Port at the time. Dr. Bruce Low explained that with the cessation of hostilities, and the return of troops from the many fields of operations, the Board anticipated an increased risk of the introduction of disease, and consequently a survey of the various Port Sanitary Authorities had been arranged.

All matters affecting Port Sanitary administration and hospital accommodation were inquired into, and the Inspectors, at the conclusion of their visit, expressed their appreciation of the manner in which the work was being done.

Plague.

Plague has insidiously spread itself to almost every country in the world; there is hardly one, some of whose towns or ports have not been affected during some period of the year.

Plague is primarily a disease of rats, and only affects man secondarily through the medium of the rat flea. It is easy to realise the difficulties which present themselves in preventing its extension, as both rats and fleas are so easily carried from place to place in merchandise, consequently the disease usually exhibits itself in a new country, first of all in its ports, and, unless energetic steps are taken for its suppression it subsequently extends inland.

Cases have occurred at three English ports throughout the year, viz., Bristol, Hull, and Liverpool. In Liverpool there were six cases, with four deaths. The outbreak was limited to three separate families; in the case of one family, the man first affected worked at a grain warehouse on the Dock Estate in which were found plague infected rats; in another family a woman affected worked in a rag warehouse in the City, and in this respect it is interesting to note that the cases in Bristol also originated in a rag warehouse. The outbreak at Hull was limited to a vessel which had arrived from Alexandria.

One "plague suspected" vessel arrived during the year, the s.s. "Scindia." Whilst in Gibraltar, on her voyage from Bombay, a native died on board; the cause of death being certified by the Port Medical Officer as plague. On arrival at Liverpool all were found well on board, subsequently a native became sick, and he was removed to the Port Hospital for observation. This case, however, proved to be non-infectious. All the men's quarters and clothing were disinfected, and the cargo was searched for rats before removal from the ship. In consequence of Glasgow cargo remaining in the holds, they could not be fumigated at this Port, and the Port Medical Officer of Glasgow was notified to this effect.

The principal places abroad which were affected were India, particularly the Madras presidency, where a large number of deaths occurred; also Bombay, Calcutta, Rangoon, and Colombo. Alexandria in Egypt. A few cases occurred in South Africa, in the Orange Free State. In addition to the more important places mentioned, plague has appeared in others too numerous to detail.

The following ports have been scheduled as plague infected and suspected, and vessels arriving therefrom have been visited by the Boarding Medical Officers throughout the year:—Bombay, Calcutta, Karachi, Alexandria, Bahia (Brazil), Colombo, Rangoon, and Rio de Janeiro.

Rat Plague.

The Port Sanitary Authority are constantly watching for the early detection of plague amongst the rats. With this object they employ both ratcatchers and rat searchers to trap and search on all parts of vessels and quays. Samples of live and any rats found dead are sent to the City Bacteriologist for his examination.

The finding of sick or dead rats is always treated with the gravest suspicion until the cause of death is ascertained. It must be borne in mind that a mortality amongst rats may be produced from causes other than Plague, particularly poison. The Liverpool Port Sanitary Authority now send suspicious rats to the City Analyst for his examination for poison, as a cause of death, as well as the City Bacteriologist. This additional precaution has resulted in the saving

of several boats from being undesirably treated as "suspected vessels." The laying down of rat poison on vessels should be discouraged, and only trapping methods employed, as the finding of dead rats on a vessel would most certainly lead to a suspicion of "rat plague," with the resulting quarantine delays and expenses.

During the year plague-infected rats were discovered simultaneously in two different localities on the dock estate; energetic measures were at once taken to prevent the extension of the disease, and to minimise as far as possible the risk of any future outbreak. Whilst bearing in mind the scarcity of labour, the work and expense entailed were considered to be absolutely essential in view of the serious position of Liverpool possibly becoming declared an infected Port.

To prevent the spread of infection to other ports and districts, letters and circulars were again sent to the various steamship owners, wharfingers, and others concerned, requesting the adjustment of rat guards on all vessels, and pointing out the necessity for removing all harbourage for rats.

The plan adopted for eradicating the rats from the infected areas was as follows:—

The infected foci were taken as the centre of a circle, and the rats were driven from the circumference towards the centre, where they were caught with traps and trays. Rat raids were also organised, and in this way bags of 50 and 60 were obtained at the raids.

The City Authorities co-operated by catching in the adjoining warehouses, sewers, and stables. A survey was made of the whole of the Port Sanitary district with the object of making the district as far as possible rat-proof. It is most difficult to keep rats out of sheds and warehouses, particularly the older ones, but much good can be done by seeing that little shelter is afforded them. Each shed was examined, and made, as far as practicable, rat proof by the filling up of rat holes, blocking up of spaces under offices, and by the removal of unnecessary harbourage, etc. The Mersey Docks and Harbour Board have issued the following notice, which will greatly assist the Port Authority in the removal of rat harbourage:—

MERSEY DOCKS AND HARBOUR BOARD.

N O T I C E .

Ashes and Rubbish are prohibited from being deposited on the Dock Quays and Roadways, except with the consent of the District Traffic Managers, and then only in such positions and for such periods as may be approved by them.

Ashes, etc., which are allowed to be deposited on the Dock Quays and Roadways as above-mentioned will be subject to the usual charges.

By Order,

ALFRED CHANDLER,

General Manager and Secretary.

It is gratifying to record that the Mersey Docks and Harbour Board, various shipping firms, and others concerned, have given their prompt and willing assistance to the officers of this Authority.

During the year 12,559 rats were trapped on ships and quays. The returns of these rats will be found in Table I.

Fumigation of Vessels.

The fumigation of vessels whilst in port is now considered to be the most important means of exterminating rats on shipboard; and adoption of regular treatment by fumigation is the best measure of keeping the vessels free from rats.

During 1916, 70 vessels were fumigated for rat destruction, as compared with 53 vessels in the preceding year, and the number of rats found dead after fumigation was 2,115.

The International Sanitary Convention of Paris, 1911-12, recommended persistent and regular fumigation of vessels to destroy rats and to reduce their numbers.

In all cases where fumigation of vessels has been carried out for the purposes of rat destruction, certificates have been issued. There has been considerable demand for these certificates by foreign and colonial quarantine authorities.

TABLE 1.

Table showing the number of Rats obtained on ships and quays by the Authority's rat-catchers.

Year.	NUMBER OBTAINED.			NUMBER					
				EXAMINED.			DESTROYED.		
	From Ships.	From Quays.	Total.	From Ships.	From Quays.	Total.	From Ships.	From Quays.	Total.
1910	1,976	77	2,053	1,554	76	1,630	422	1	423
1911	3,097	934	4,031	2,007	920	2,927	1,090	14	1,104
1912	3,472	1,098	4,570	2,311	1,054	3,365	1,161	44	1,205
1913	7,943	958	8,901	3,280	938	4,218	4,663	20	4,683
1914	10,083	944	11,027	5,264	917	6,181	4,819	27	4,846
1915	9,400	1,256	10,656	6,204	1,234	7,438	3,196	22	3,218
1916	*10,881	1,678	12,559	7,064	1,312	8,376	3,817	366	4,183
£ Total.....	46,852	6,945	53,797	27,684	6,451	34,135	19,168	494	19,662

• 2,115 of these were obtained after fumigation.

TABLE 2.

CITY AND PORT OF LIVERPOOL.

RETURN OF RATS CAUGHT, EXAMINED OR DESTROYED.

DATE.	CITY.			PORT.			CITY.		PORT.		TOTAL CAUGHT
	Ware- houses, Stores, &c.	Sewers.	Other Sources.	Total.	Ships.	Quays.	Other Sources.	Total.	Ex- amined.	Des- troyed.	
1916.											
January	269	600	235	1,104	776	58	—	834	247	638	1,938
February	342	497	158	997	835	60	—	895	234	810	1,892
March	321	529	403	1,253	892	77	—	969	252	729	2,222
April	398	320	293	1,011	694	60	—	754	175	594	1,765
May	362	368	333	1,063	1,168	69	—	1,237	192	710	2,300
June	493	269	425	1,187	746	77	—	823	193	719	2,010
July	673	346	324	1,343	626	60	—	686	222	527	2,029
August	413	329	375	1,117	1,209	73	—	1,282	151	966	2,399
September	380	556	326	1,262	799	67	22	888	136	1,126	2,150
October	168	564	232	964	1,064	207	391	1,662	102	862	2,626
November	489	397	331	1,217	1,163	173	83	1,419	107	1,110	2,636
December	455	359	330	1,144	909	128	73	1,110	46	1,098	2,254
	4,763	5,134	3,765	13,662	10,881	1,109	569	12,559	2,057	8,376	*26,221

Number of rats caught (City)	13,662
Number of rats examined (City)	2,057
Number of rats caught (Port)	12,559
Number of rats examined (Port)	8,376
Total Number of rats caught (City and Port)	26,221
Total Number of rats examined (City and Port)	10,433

* These figures do not include rats caught or destroyed by various shipping firms employing their own rat-catchers or rat-catching companies.

Distinguishing Character of Rats.

BLACK RAT (*MUS RATTUS*).

Average total length	...	...	...	14·9 inch.
Tail	...	...	...	8·1 ,,
Hind foot	..	...	...	1·4 ,,

Long head, sharp muzzle, large and broad ears, tails longer than head and body combined.

Fur of a sooty colour, softer and denser than brown rats.

This rat is the domestic rat of India, and is chiefly concerned in the spread of plague by ships. It has already established itself in most of our seaports especially in the docks and warehouses.

EGYPTIAN RAT (*MUS ALEXANDRINUS*).

Average total length	...	...	...	15·5 inch.
Tail	...	...	...	8·4 ,,
Hind foot	...	...	...	1·4 ,,

Generally resembles the above, except the colour and texture of the fur. Above it does not differ from the brown rat, but the under parts are more yellowish.

The fur is commonly shorter and harsher in texture than the black rat (but not always apparent).

BROWN OR GREY RAT (*MUS DECUMANUS* OR *NORVEGICUS*).

Average total length	...	...	...	16·3 inch.
Tail	...	...	...	7·1 ,,
Hind foot	...	...	...	1·7 ,,

Large short head, more obtuse muzzle, small ears, relatively short and stout tail, grey brown above and white below, over hairs of upper parts have black tips, tail shorter than head and body combined.



(MALE.)
 BLACK RAT (*Mus rattus*). The ship-rat or domestic rat of India. (FEMALE.)



(FEMALE.)
 BROWN OR GREY RAT (*Mus decumanus or norvegicus*). The common English rat found in warehouses, sewers, etc. (MALE.)

Rat Destruction, etc.

The trapping, destruction and examination of rats from ships and dock quays have been carried out as usual during the past year.

The tables annexed give the complete returns from the year 1910 of the rats caught on ships or quays with the number sent for special examination by the City Baeteriologist. A complete return of the 26,221 rats caught during the year 1916 by the Health Authorities of the City and Port of Liverpool is also given in Table .

We are indebted to various shipping companies who employ rat-catchers; also to the Zeba Ratcatching Company for supplying a return of rats caught and destroyed on vessels in the docks of the Port of Liverpool.

The following table gives a combined return of all rats caught and destroyed by shipping companies employing their own ratcatchers, by rateatching companies, and by the Public Health Authorities.

PORT.

On quays and vessels	73,358
----------------------	-----	-----	-----	-----	-----	--------

CITY.

In warehouses	...	...	...	...	4,763
In sewers and other places	...	...	...	...	8,899
					<hr/> 13,662
					<hr/> <hr/> 87,020

Cholera.

In the Philippine Islands the mortality from this disease has been very heavy during the year.

An epidemic occurred amongst the Turkish soldiers in Constantinople, and eases were constantly occurring in various parts of Turkey in Asia. Of the Indian towns, Bombay, Calcutta, and Karachi suffered mostly.

The disease was also prevalent in Indo-China, Japan, and Austria-Hungary.

Yellow Fever.

This disease is one which, with improving sanitation, is gradually becoming eliminated, and now it is practically confined to tropical America, Guayaquil in Ecuador, and Merida in Mexico being the only two places of any importance which reported cases.

NOTIFIABLE INFECTIOUS DISEASES.

A considerable number of cases of Measles, Scarlet Fever, Diphtheria and Chickenpox arrived in the Port; by far the larger number were cases on board passenger vessels from the United States and Canada. A large number of cases of infectious sickness have been landed from His Majesty's hospital and other ships, and were removed to the City Infectious Diseases Hospitals; these included cases of Enteric Fever, Measles, and Scarlet Fever.

Typhus Fever.

Large epidemics of Typhus Fever occurred in Russia at Moscow, also throughout the province of Galicia in Austria, and in the City of Mexico in South America. At Cairo and Alexandria in Egypt, and Tokyo in Japan, there have also been less extensive outbreaks.

Smallpox.

Smallpox continues prevalent abroad, the largest epidemics occurring in the provinces of Annam and Tonkin in Indo-China, and Galicia in Austria. A large number of cases also were reported from Hong Kong in China; Moscow and Petrograd in Russia; Bombay, Madras, and Rangoon in India; Valencia and Madrid in Spain; and Athens in Greece.

On the evening of March 20th, information was received from H.M. Customs that the s.s. "Antinoe," from Cette, via Seville, had arrived, and that the master had reported there were two sick men on board. As no tug was available the vessel was allowed to proceed into the Alfred basin, and was there held up in the middle of the dock, the Assistant Medical Officer then boarded her by means of a rowing boat. On examination two members of the crew were found to be suffering from smallpox. The patients, along with four contacts, were removed by ship's boat to the Port Isolation Hospital; two of these contacts subsequently developed the disease whilst in hospital. All on board were vaccinated and the vessel was completely disinfected. There was no further extension of the disease.

On the homeward voyage of the steamship "Henzada" from Rangoon a seaman developed a suspicious eruption, which at Suez was pronounced to be smallpox. The native quarters were there disinfected, and 36 of the crew and passengers vaccinated by the ship's surgeon. On arrival at Liverpool on the 3rd March, the vessel was visited by the Assistant Medical Officer, who found three natives to be suffering from smallpox. They were removed by ship's boat to the Port Isolation Hospital. Fifty-five more of the crew and passengers, who had refused vaccination by the ship's surgeon, were prevailed upon to accept vaccination by the Assistant Medical Officer.

The ship was thoroughly disinfected, and the names and addresses of the crew and passengers were obtained and forwarded to the Medical Officers of Health of the districts of their destination. During the stay of the vessel in port she was kept under daily observation, and no further cases developed.

In addition to the above, 20 cases of smallpox occurred upon Liverpool-bound vessels. The following vessels reported cases:—

S.S. "Highland Monarch"	...	...	...	from Bombay.
S.S. "Burma"	...	...	...	,, Rangoon.
S.S. "Kalibia"	...	...	...	,, Rangoon.
S.S. "Medomsley"	...	...	...	,, Bombay.
S.S. "City of Nagpur"	...	...	...	,, Calcutta.
S.S. "Leicestershire"	...	...	...	,, Rangoon.
S.S. "Lake Manitoba"	...	...	...	,, Aden.
S.S. "Castalia"	...	...	...	,, Bombay.
S.S. "Olympia"	...	...	...	,, Bombay.
S.S. "Bengali"	...	...	...	,, Calcutta.

Anthrax.

Nineteen cases of this disease, with five deaths, were reported to the Department during the year. Of these fifteen were reported to the Local Government Board as residing in the Liverpool district, four resided

outside the City. In the latter cases the infection was contracted at work in Liverpool. One of the cases resident in the City was infected whilst employed at the Liverpool Tannery Company's Works, Litherland.

A large proportion of cases (namely seven) occurred amongst wool warehousemen and porters, East Indian wool being responsible for the infection. Eight cases were reported amongst those handling or in some way associated with imported hides, others were hair curlers, ships painters, or labourers.

Everything possible has been done by the Authority to prevent the occurrence of this disease. The Docks and other places where workmen are liable to infection are frequently visited and instructions given to foremen and labourers as to the dangers of this disease; handbills, etc., have been issued so as to make its dangers generally known, and the advisability of seeking immediate medical attention when any suspicious evidences of the disease appear.

This has in many cases been followed by good results in regard to recovery, but cases still arise where neglect or delay in applying for treatment have resulted in a fatal issue.

Disinfection of Hair Infected with Anthrax Spores.

Some experiments have been carried out on the disinfection of pig hair infected with Anthrax spores, the apparatus tested being that used by a well-known firm of hair curlers in the City.

The experiments were conducted as follows:—

Clean and sterilised pigs bristles were soaked in an emulsion of a recent agar growth of Anthrax bacilli containing anthrax spores.

These bristles were slowly dried and placed in prepared open glass tubes of small size, plugged lightly with cotton wool; each of these tubes was securely surrounded by a layer of cotton wool to protect it from damage.

The tubes were placed in different situations in the chamber amongst a consignment of ropes of twisted horse hair, which was being sterilised.

The first experiment was carried out at a temperature of approximately 260°F. for 15 minutes and the second experiment was at 220°F. for 5 minutes.

First Experiment.

The temperature reached was approximately 260°F. for a period of 15 minutes. The test samples were placed in the centre, top and sides of this hair mass.

	TEST OF GROWTH ON USUAL CULTURE MEDIA.	
	Broth Culture.	Agar Culture.
Top	Negative	Negative
Centre	Negative	Negative
Sides	Negative	Negative
Control	Positive	Positive

The process had therefore completely sterilised the hair.

Second Experiment.

The temperature reached was approximately 220°F. for a period of 5 minutes. The test samples were placed as in the previous experiment.

	TEST OF GROWTH ON USUAL CULTURE MEDIA.	
	Broth Culture.	Agar Culture.
Top	Negative	Negative
Centre	Negative	Negative
Sides	Negative	Negative
Control	Positive	Positive

The process had therefore completely sterilised the hair.

TABLE 3.

INFECTIOUS DISEASE.

The actual number of cases of infectious sickness landed from vessels arriving in the Port of Liverpool during the years 1915 and 1916, and the comparison with the average of the preceding 10 years, is shown in the following Table:—

Diseases.	Number of Cases.		Average for the 10 years preceding 1915.
	1915.	1916.	
Smallpox	0	7	5·6
Scarlatina	17	8	14·5
Cerebro Spinal Meningitis	0	2	0·5
Poliomyelitis	0	0	0·1
Enteric Fever	40	27	39·7
Do. (suspected)	0	0	4·5
Diphtheria	4	9	8·2
Measles	39	32	26·7
German Measles	2	0	0·9
Whooping Cough	0	0	0·1
Erysipelas	12	8	5·3
Chicken Pox	18	10	7·2
Cholera and Choleraic Diarrhœa .	0	0	0·6
Yellow Fever.....	0	0	0·5
Plague	0	0	0·8
Suspected Plague	0	0	5·3
Puerperal Fever	0	0	0·3
Phthisis	72	48	34·4
Leprosy	0	0	0·1
Totals.....	204	151	155·3

TABLE 4.

INFECTIOUS DISEASE.

The number of cases of infectious sickness reported to have occurred on Liverpool-bound ships during the years 1915 and 1916, and which were disposed of prior to the arrival of the vessel at this port, and the average of such cases for the preceding 10 years, are as follows:—

Diseases.	Number of Cases.		Average for the 10 years preceding 1915.
	1915.	1916.	
Smallpox	56	20	15·9
Scarlatina	7	0	0·6
Cerebro Spinal Meningitis	0	3	0·1
Enteric Fever	15	18	16·2
Diphtheria.....	4	2	3·2
Measles	12	19	6·7
German Measles	1	1	0·9
Erysipelas	3	2	0·5
Chicken Pox	7	2	4·3
Cholera and Choleraic Diarrhœa..	2	0	5·6
Yellow Fever	0	0	3·8
Plague	0	1	2·2
Suspected Plague.....	0	0	1·5
Phthisis.....	9	0	2·3
Totals.....	116	68	63·8

Sanitation of Vessels.

The sanitary conditions of vessels, which are likely to affect the health of the seamen, are closely supervised by the Port Sanitary Inspectors.

These defects may be classed under three headings, viz. :—

- (a) Faulty construction.
- (b) Wear and tear.
- (c) Lack of cleanliness and nuisance.

These are shewn in detail in the accompanying table.

A large number of defects, due to lack of cleanliness and such conditions causing a nuisance, found on British ships, arise from the crews having finished the voyage and having been paid off, the quarters are unoccupied. This is more often found to be the case in the tramp class of vessel.

The Inspectors made 6,065 visits and re-visits to vessels during the year.

It is satisfactory to note that 2,165 nuisances reported on vessels in the docks were remedied forthwith; no legal enforcement being required; there has been in almost every instance a willingness on the part of the owner or master to meet the Authority in carrying out the recommendations.

Those ships on which nuisances have been reported and escaped observation as to abatement are few and are mostly here for only a short time, and it has been impossible for the officers to follow them up.

Canal Boats.

The Inspectors of the Port Sanitary Authority have been appointed Canal Boat Inspectors under the Canal Boats Acts, 1877 and 1884. This is rendered necessary by the large number of canal boats which are to be found lying in the Liverpool docks. By rotation one inspector devotes one day per week for a period of five months at a time to the work, as it has been found that in this way it is easier to follow up any boat that may be defective.

These boats are for the most part kept in very good repair.

INSPECTION OF SHIPPING.

Year 1916.

TABLE 5.

The following Table indicates the number of visits paid to vessels by the Inspectors during the year :—

Nationality.	Visits.	Re-visits.	Total.
British ...	3,152	2,085	5,237
Norwegian ...	139	58	197
Swedish...	53	17	70
Spanish...	113	163	276
Danish ...	48	23	76
American ...	59	49	108
Italian ...	7	6	13
Belgian ...	3	2	5
Russian...	13	4	17
French ...	12	7	19
Dutch ...	12	3	15
Greek ...	19	5	24
Uruguayan ...	1	—	1
Chilian ...	1	—	1
Argentine ...	1	3	4
Brazilian ...	2	—	2
Total ...	<u>3,635</u>	<u>2,430</u>	<u>6,065</u>

SUMMARY OF INSANITARY CONDITIONS.

TABLE 6.

Class of Vessels.	Number Inspected.	Number on which nuisances were found.	Per cent.
FOREIGN—			
Steamers	2,290	617	26·94
Sailing	76	18	23·68
Total... ..	2,366	635	26·84
COASTWISE—			
Steamers	993	41	4·13
Sailing	276	18	6·52
Total... ..	1,269	59	4·65

Nationality.	Number Inspected.	Number on which Nuisances were found.
British	3,152	612
Foreign	483	82
	3,635	694

Nuisances arising through

Defects of Original Construction.	Per cent. of Total Defects.	Structural Defects through wear and tear.	Per cent. of Total Defects.	Dirt, and other conditions prejudicial to health.	Per cent. of Total Defects.
11	0·44	292	11·82	2,168	87·74

TABLE 7.

THE FOLLOWING TABLE SHOWS THE NUMBER AND NATIONALITIES OF THE VESSELS ON WHICH DEFECTS WERE DETECTED DURING THE YEAR 1916.

NATIONALITY.	Number of Ships.	Dirty Forecasts.	Dirty Wash-houses, Store-houses, etc.	Foul Water Casks.	Foul Bilges.	Foul W.C's.	Accumulations of offensive refuse.	Gear stowed in Crew's Quarters.	Damp Quarters.	Water lodging on top of Forepeak Tank.	Animals kept, causing nuisance.	Leaky Decks overhead.	Defective Stoves.	Defective Bulkheads.	Defective Ports and Sky-lights.	Defective Ventilators.	Defective Flooring Boards.	Defective Hatches and Lockers.	Defective Chain Pipes.	Defective Hawse Pipes.	Defective W.C. Fittings.	Defective Soil Pipes.	Inadequate Ventilation.	Inadequate Lighting.	Inadequate Drainage.	Bare Iron not Sheathed.	W.C's deficient in Ventilation and situation bad.	Total number of Defects.	Total Remedied.
British ...	612	1360	50	5	...	576	8	2	7	...	...	51	12	15	112	7	1	3	13	3	12	3	...	...	6	1	...	2247	1985
Norwegian ...	33	39	...	2	...	21	...	...	...	...	...	4	1	4	11	...	...	...	3	...	...	...	...	2	...	...	...	87	69
Swedish ...	6	5	...	...	...	2	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	2	...	...	...	...	11	11
Spanish ...	21	25	...	...	...	8	1	...	1	...	...	2	2	...	10	...	...	...	...	...	1	...	...	...	...	...	...	50	37
Danish ...	6	8	...	...	...	2	...	...	...	...	...	1	...	3	2	1	...	...	...	...	1	...	...	...	...	...	...	18	15
American ...	6	9	3	...	...	5	...	...	4	...	...	1	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	25	20
Italian ...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
Belgian ...	1	1	...	...	...	1	...	...	...	...	...	...	...	1	4	...	...	...	...	...	...	...	...	...	...	...	...	7	1
Russian ...	1	2	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3
French ...	1	3	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	5
Dutch ...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
Greek ...	3	5	...	...	...	...	...	...	...	...	...	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	8	8
Uruguayan ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chilian ...	1	4	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	5
Argentine ...	1	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
Total ...	694	1466	53	7	...	619	9	2	12	...	...	63	15	29	142	10	1	3	16	3	14	3	2	2	6	1	...	2472	2165

MARINE HYGIENE.

The following is an epitome of a Report on Marine Hygiene prepared by Dr. W. Hanna, Assistant Medical Officer of Health, Liverpool.

The Report describes suggested improvements in the sanitary condition of vessels, some of which have already been installed on vessels of recent construction.

The improvements suggested are the outcome of many years' experience gained by investigation into the conditions prevalent on ships frequenting our ports, and of the ailments and diseases affecting sailors. It is felt that the suggestions ought to be widely known and considered, especially at a time when the building of vessels, on possibly new lines, is being planned and expedited.

The standardisation of vessels will facilitate the rapidity of construction, but what is of as great importance is the concentration of all our modern experience on the building of vessels of a standard hygienic type.

The British Admiralty from reports recently published on the hygienic conditions and ventilation of modern warships has shown that the present is a suitable time to consider and act upon these matters, and since the health of the mercantile marine is only second in importance to that of the personnel of the Royal Navy, nothing can be gained from waiting until after the war.

1.—Situation of Crew's Accommodation.

The situations for crew's quarters most open to objection are those situated forward, for the reason that they are placed in the most exposed place in the ship as regards strain, stress of weather, and danger, and are unsuitable and inconvenient for the provision of ventilation and the general working of the ship.

The placing of berths adjoining engine rooms, galleys, etc., should not be permitted; the heat, the impurity of air from engine fumes, and bad ventilation, make these places most insanitary, and, in addition, the rooms next the galleys frequently harbour vermin behind the warm sheathing of the bulkheads. When berths are situated in alleyways there

should be a constant current of pure air through the alleyway, and the berths and cabins situated as shown in the Diagram No. 1. A suitable arrangement of the crew is as follows:

Diagram No. 1.

1. Forward at Bridge: Navigating officers' quarters situated under the bridge deck.
2. Amidships: Petty officers (starboard side) alongside engine room (A). Engineers' (port side) amidships near engine room (B).
3. Aft: Crew in deckhouses or cubicles (D), with w.c., lavatories, bathrooms, urinals, etc.

By this arrangement greater facilities will be found for ventilation and other purposes.

2.—Crew Space.

The amount of space required for crews is closely bound up with the facilities for changing the air. If one could provide more frequent changes a smaller space would suffice, but the rate of air change is limited, and it is impossible to have air travelling at a greater speed than about two or three feet per second, otherwise a draught is caused. It is necessary, therefore, to have as much unencumbered space per man as is possible.

The space provided under the Merchant Shipping Act, 1906, which gives 120 cubic feet and 15 superficial feet per man, cannot be considered as at all satisfactory from the fact that if a portion of this space be given up for a messroom or washplace the minimum is still kept at 72 cubic feet per man for sleeping accommodation.

The cubic space for soldiers in barracks is 600 cubic feet; in common lodging-houses it is 300 cubic feet; but the provision of 72 cubic feet for sailors' sleeping accommodation, even under the best conditions, must be considered as wholly unsatisfactory.*

* The Committee appointed by the Admiralty to investigate and report on the best methods of ventilating modern warships reported that certain accommodation of a constructional nature was urgent, and as a result a definite minimum standard of 200 cubic feet of individual cubic space for sleeping places was laid down, and a uniform minimum fan supply of 3,000 cubic feet of air per hour, per man, was arranged for all sleeping, working and living places.

3.—Cubicle Accommodation.

An arrangement such as given in the Diagrams Nos. 1 and 2 will furnish an ample amount of space for seamen, and the quarters will be placed in a healthier and safer position.

The quarters are arranged for the European and Lascar crew of a vessel of approximately 4,000 tons. The cubic capacity is 220 cubic feet per man, with a floor space of 25 superficial feet per man. Separate messroom is attached, and ample washing and w.c. accommodation.

The rooms are ventilated by a perforated shaft (N), which runs through the series of cubicles, introducing fresh air; this is well illustrated by the diagrams. The object of the fan in the shaft, instead of a movable cowl, is to get the air at an even pressure at all times, whether at sea or in port, and so the crew are unable to interfere with the ventilation apparatus unless under proper direction.

The Lascar quarters consist of a large space capable of accommodating 30 to 40 men, with bunks of the iron type already mentioned, and placed at a distance from the sides of the ship. The quarters are ventilated and heated on the principle already referred to.

An alternative scheme, providing suitable cubicles, each capable of accommodating four Lascar seamen, could be arranged on the same lines as for Europeans. The cubicles are arranged on each side of a central mess or day room, and are free and open to the general ventilation of the forecastle. In addition to natural light from port-holes, a large skylight gives ample light for the quarters; the inner cubicles, in addition, have electric light. The cubicles are large, and give a cubic space of 120 cubic feet per man for sleeping room, instead of 72 cubic feet as at present. The Lascars have ample washing and lavatory accommodation.

When it is desirable to use the older type of crew quarters in forecastles for Europeans, Diagram No. 3, *a* and *e*, the arrangements could be much improved by providing additional messing accommodation (*b* and *f*), and in this space suitable lockers for light clothing could be provided (see Lockers). There is room for ten men on each side. In connection with these forecastles, an arrangement is made whereby the forepeak hatch, which is frequently situated in the quarters, and is

highly objectionable when used for paints, ropes, etc., is cut off from these quarters, and placed outside in the alleyway, K, and may be used to store the men's chests; it is suitably ventilated. Provision should always be made for heavy and wet clothing in a space outside the quarters. A suitable drying room could be arranged with steam piping. All chain casings in forecastles should be made of metal, instead of wood as is often the case.

In some of our small coasting steamers, which carry only two or three seamen, the quarters are so restricted that the men are frequently cramped and boxed up in wooden bunks which frequently harbour vermin (Diagram No. 4). It is most important to have these wooden bunks removed, and the seamen to use canvas cots or hammocks which can be hoisted or stowed away during the day.

4.—Ventilation.

On ships, fresh air with an equality of temperature and moisture is just as essential as on land, and, from a study of the conditions of crew spaces, etc., on shipboard, we must conclude that in very many cases the provision of this fresh air is much neglected, and in many cases impossible to obtain owing to the construction and situation of the quarters.

In addition to fresh air there must also be an equality of temperature and a suitable amount of moisture. In former times it was firmly believed, even by medical men, that the accumulation and stagnation of the breath and perspiration of human beings crowded for a period in a confined air space was the cause of plague and fever. Subsequently the chemical theory of the evil effects of living in close and confined rooms gained a foothold in the scientific and popular mind. This theory holds that the air becomes deprived of oxygen, and that it contains an organic poison of the expired air. These latter views are now widely held, and it is only within the past year or so that further experiments have been carried out under Government auspices.

Experiments showed that little attention had been paid so far to the temperature and movement of the atmosphere, and the amount of moisture which it contains. It has been shown that there is no evidence of the supposed existence of organic poisons in expired air; the bad effects of confined quarters and the value of fresh and open air depend

on the question of the amount of heat and moisture in the atmosphere. Cool air acts upon the skin, removing heat, stimulating the nerves, contracting the blood-vessels, and increasing the metabolism generally.

Apart from the large liners, which are usually provided with some efficient ventilating system, the majority of ships at the present time are ventilated by the provision of inlets and outlets for fresh air, such as revolving cowls, mushrooms, or goose-neck ventilators through the deck, or portholes, etc.

At sea, however, it is found that, unless in fine weather or in port, it is impossible to open many portholes and skylights for ventilation purposes. When ventilators are badly placed and cause a draught, they are naturally stopped by the seamen in cold weather, or the cowl may be removed and the ventilation socket covered with canvas and painted, thus effectually excluding all air.

In such quarters where the men have a minimum space, and live crowded together in a hot and confined atmosphere, the men degenerate, are of filthy habits, spitting is unchecked, and the spread of such diseases as phthisis and pneumonia is facilitated. Sir Thomas Oliver, the Home Office expert, at a Special Committee on Dangerous Trades in 1908, stated "the common diseases of sailors, such as those of the respiratory organs and heart, including rheumatism and phthisis, are partly the result of their immediate environment or insanitary surroundings, also the result of exposure and getting wet."

This points to the provision of more suitable accommodation for our seamen: in fact, the crowding of men in confined forecastles is decidedly bad, not only because of the difficulty of ventilating forecastles, but from the danger of a consumptive seaman infecting his companions during a long voyage. It is important that means should be taken to prevent the spread of the infection on ships, as far as possible, by arrangements such as the more frequent provision of cubicle accommodation for ships' crews.

In the case of small vessels, some degree of natural ventilation can usually be obtained by a suitable arrangement of ports and cowls, but the more frequent use of electric fans to stir up the air and carry off excess moisture should be advocated. Improved ventilation could be provided as follows:—Instead of the usual cowls (inlet and outlet), an

electric fan is arranged in an inlet shaft, running at two speeds, fast and slow. This fan would drive air into a shaft which could be carried into and around the quarters at a lower level than the bunks; this shaft is perforated with numerous small holes (about $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in diameter) to admit the air into the forecastle. The air would not impinge directly on any occupant of a bunk or cause a draught in the quarters; it must not flow at a greater velocity than three feet per second. Outlet shafts may be fixed in suitable situations. By the provision of a perforated shaft of this character, there will be no opportunity for the seamen to stop up the holes, and the even distribution of the air will give no necessity.

In large vessels, it will not be possible to get an efficient ventilation suitable for all climates by natural means. Several well-known systems are now in use on our large steamers, both cargo and passenger; these require no description, and are excellent for the purpose to which they are applied. The extraction and plenum systems are in use, but the improvements in the plenum system have been so great that the extraction or vacuum system has fallen into disfavour. Probably a combination of the plenum and vacuum systems would be best.*

The great disadvantage of the vacuum system is that the source of air supply and its course cannot be controlled.

The manner of distribution of the fresh air into the interior of the ship is a matter of great importance. There is great variation in the manner of distribution, and each ship will have to be ventilated according to its own plan of construction. This, and other matters, would be rendered much more easy of accomplishment if the building of ships was standardised.

On very large liners one method which has had good results and allows of several changes of air per hour in the cabins, consists in using four large fans (5 feet in diameter) driven by electric motors; these drive the fresh air from the upper deck into shafts suitably distributed. The air is sufficiently heated on entering, by means of steam coils, to allow the temperature of 60° F. to be maintained in the terminal distributing shafts.

* Following the Report to the Admiralty already referred to, the Admiralty has adopted the plenum system combined with natural exhaust for living spaces, and the fan exhaust with natural supply for spaces in which disagreeable odours, great heat, water vapours or deleterious gases are generated,

The exhaust fans for extracting the vitiated air from the cabins should be of smaller capacity than the blowing fans, to enable a slight internal pressure to be always maintained.

The fresh and warmed air is blown into the passages and alleyways of the ship. This air passes through the louvres in the lower panel of the doors, and the vitiated air is extracted from the top of the rooms by exhaust openings connected with fans. When the rooms are large, as in the case of saloons which are never at any time so crowded as to overheat the atmosphere, the air may be admitted at the top.

Very good results may also be obtained by reversing the process, i.e., by supplying fresh warmed air passing into the alleyways to find its way out through exhaust openings, as already mentioned in connection with the cubicle system (see Diagram 2). When the ship passes through warm latitudes, the steam can be shut off from the thermo-tanks and pure fresh and cooled air driven into the air shafts.

The air shafts, which are carried to the remote parts of the ship, as on large passenger or emigrant liners, should have large fans as described, to drive the air to the terminal ducts, and in the case of a breakdown of any fan, there should be suitable inter-connections made with adjoining air ducts and fans to secure a sufficient supply of air, and to keep the ventilation in perfect working order.

5.—Ventilation of Engine Room and Stokehold.

It is very important in the interest of the engineers and stokers to thoroughly ventilate the engine rooms and stokeholds. This matter frequently receives little consideration, and cases of heat apoplexy are not uncommon amongst stokers in warm latitudes.

The usual method of ventilating the engine room of a steamship is to carry down sheet iron cowl ventilators from the upper deck to a suitable distance from the bottom platform, the number of ventilators depending on the design of the engine room and the type of engine used, e.g., there may be from two to four ventilators in a vessel fitted with single screw reciprocating engines. In this form of ventilation no provision is made for the ventilation of the wings or sides of the engine room, nor are the stokers provided for; the air is simply driven down,

and on being heated ascends from the bottom opening of the ventilator, without reaching the wings of the engine room or stokehold.

The air in the wings of the engine room, and also the stokehold, rises to a much higher temperature than that in the centre of the engine room. The temperature of the air in the engine rooms of turbine-fitted vessels is also much higher than that of engine rooms where reciprocating engines are used, because the trunk heads are smaller, the deckhead of the engine room is lower, and the heated air cannot get away. To overcome these difficulties the arrangement shown in the Diagram No. 5 is suggested. The air should be changed about fifteen times an hour.

Two large cowl ventilators A and B, Diagram No. 5, with electric fans, are used to carry air down into the engine room. One, A, discharges at a suitable distance from the bottom platform; the other, B, when it reaches its lowest point, divides into two branch shafts, which are carried to the furthest corner of the wings of the engine room in a V-shaped manner. These shafts are perforated with small perforations, allowing the air to pass from the trunk and become generally diffused. It escapes by passing up the exhaust shaft C. There is no fan required in this shaft.

The sides or wings of the stokehold get very hot, and more use might be made of electric fans in providing fresh air for these remote corners, as shown in Diagram 5. The air is drawn from the upper deck, driven down an iron shaft through the fiddly grating, and passes through a perforated portion of the air trunk at G, where it enters the upper part of the stokehold. An arrangement of large fans placed in the upper part of the stokehold (E) forces the air onwards, and directs it by a baffle plate (F) down towards the entrance to the furnaces. This arrangement will give an ample supply of ventilation to the stokehold, and the air will escape by the furnace ashpits and doors and so up the funnel. The speed of the fans would be such as to give about fifteen changes of air per hour. A suitable arrangement for a turbine steamer is shown in the sketch.

For passage through the tropics, wind cowls, sails, electric fans, or portlight wind chutes are now usually employed to obtain this supply of constantly moving air. Wind chutes are largely used in the Royal Navy in warm climates with satisfactory results.

6.—Heating.

The heating of crews' quarters must be frequently carried out in small vessels by means of stoves; in fact, in many vessels it is the only way to heat the living quarters of officers and crew. The usual bogie stove, however, is frequently of inferior make, and rusts owing to condensed water depositing upon it, and so the pipes become corroded, causing smoke-leaks and the entrance of fumes into the sleeping quarters. An improved type of stove is shown in the Diagram No. 4. It consists of a corrugated iron body with a lining of fireclay tiles. It has not the same tendency to crack and give off fumes; it is also more economical. The stove has a ventilating arrangement attached, as shown in the diagram.

In vessels of large size, steam heaters are handy, but they distribute heat unevenly, at least in large spaces, and frequently leak at the joints; the floor of the quarters is constantly damp, and they usually collect dust and dirt in the forecastle. In many large vessels the quarters and rooms are heated by passing in heated air from a thermo-tank system, but it is more advisable, for the reasons which have already been given, to introduce fresh, cool air, and to heat the quarters by improved steam radiators in a separate system.

7.—Lighting.

It is very desirable that the light of living quarters should be more carefully arranged. Frequently the facilities for lighting are very deficient, and artificial lighting with lamps, etc., has to be resorted to. Electric lighting has made a great improvement in the larger vessels.

Port lights are good provided they are of sufficient number and size. Objections to port lights are that in many cases they soon become cracked and leak. This may be minimised by having port lights with two lugs in addition to the hinge, as it is found that ports with one lug more frequently break.

Deck lights are good if properly countersunk and well bedded. The glass in mushroom ventilators frequently breaks.

Skylights are excellent, but should have a good combing above the deck; instead of the ordinary square glass panes with guards, they should be fitted with bull's-eyes of very thick glass.

8.—Berths and Bunks.

In order to utilise the space provided to the best advantage, and to give the seamen the utmost air space and light, the old-fashioned wooden and boarded-in bunk figured in the Diagram No. 4 must be dispensed with. The bunk most suitable is made of iron, having spring copper wire bottom and iron rails at the top and sides; they should be 6ft. 6in. by 2ft. 3in. The bunk may be fitted, as shown in the Diagrams Nos. 1 and 3, by inserting the side and other pieces into properly provided sockets in open uprights. It is necessary to have these iron pieces made solid, or tubular, and filled with pitch or other material to prevent harbourage for insect vermin. The whole series of bunks can be removed for cleansing; or the bunks may be made collapsible or folded up by a hinged joint. This arrangement gives much more room for seamen, or when the quarters are being cleansed out.

The situation of bunks close to the ship's side must be avoided, so that the complaint of condensed moisture dripping or trickling into the bunks in badly-ventilated and heated quarters is avoided. Of course, it is quite understood that all bare iron is coated with cork or other suitable preparation. Sheathing with wood gives harbourage for insect vermin.

The use of a removable side-board between the iron side-plates of the ship and the bunk, to keep the bedding in place, will not be required where the above arrangement of having the bunks at a distance from the ship's side is carried out. By the use of this form of bunk the opportunity for harbourage of vermin is avoided.

The use of iron bunks provides better lighting of the crew space, and the bunks may even be placed against the fore and aft bulkhead so as to minimise as much as possible the interference with light.

9.—Lockers.

The general arrangement of lockers is in the shape of small cupboards in the crew's quarters, with little or no ventilation. This is objectionable, for usually clothing, scraps of food, and miscellaneous articles, are to be found stored in them. A better arrangement would be that no food lockers for the storage of meat, bread, food, etc., should be placed in the living quarters on vessels where the crew provide their own food. This accommodation, in the form of a locked food safe, should be placed

outside the quarters in a suitable situation: for example, on the poop aft, near the quarters. Cupboard and lockers for the crew's use for petty articles, etc., may be provided, but no heavy clothing, such as oilskins, coats, etc., liable to be wet and damp, should be hung in the men's quarters; these should be placed in a specially provided clothes locker situated outside.

Food stores or provision rooms should be lined with a light galvanized metal sheathing from floor to ceiling, the metal sheets to extend a flange on the floor to a distance of 6 inches; the door may also be sheathed in the same way, and a wire netting of small mesh fitted over any ventilating openings.

10.—Messrooms.

It has been the custom for seamen to mess in the sleeping quarters in the forecastle, a mess table and forms being provided. This arrangement is a decidedly bad one. In small vessels it is not usually possible to provide a separate messroom for the crew, but in vessels of 300 tons and upwards it ought to be possible to arrange a messroom independently of the sleeping accommodation, and this space should not be deducted from the crew's sleeping accommodation as laid down in the Merchant Shipping Act of 1906.

Two examples are given, in the Diagrams Nos. 2 and 3, of fairly large vessels, with suitably arranged messrooms. In one of them the firemen and sailors have separate messrooms.

11.—Lavatories, Closets, etc.

The usual sanitary convenience found on vessels is the trough-closet of the old-fashioned type. It is usually in a very foul condition, frequently no water in the sanitary tank, and generally neglected. It also happens that the pipe and outlet are frequently choked up. A much better arrangement would be to have separate pedestal closets of the short hopper type, connected by a common pipe, and opening directly overboard, as shown in Diagram No. 2 (4). These closets may be made of enamelled cast iron or heavy glazed stoneware. The pipe connecting the closets always retains a certain amount of water to facilitate flushing.

A continuous flow of water can be maintained at sea by the use of the donkey pump, which pumps sea water in a constant flow, not only through the main pipe below, but also causes a flush round the rim of the basin. An automatic flush tank could also be installed. An improved arrangement for the constant supply of water is shown in Diagram No. 5; it consists in the use of a small auxiliary sanitary pump, either driven by petrol or electricity, to feed all the sanitary tanks independently of the engines.

For Lascars and Chinese crews, special latrines, with a channel or groove provided in the cement floor, and opening to sea by an escape hole at the end of the channel, must be provided. The flush must be sufficient to clear the channel. These ought to be provided as shown in the Diagram No. 2 (1, 2, and 3).

In large vessels, especially on those carrying passengers, the situation and ventilation of closets and urinals require special attention, otherwise they become a nuisance, as everyone knows who has travelled on many large liners. The best arrangement in a large passenger steamer is obtained by placing them in a convenient central position in the ship, so arranged that by means of an exhaust fan, air may be drawn in through the lavatory door from the corridor, and extracted from the lavatory through a ventilator shaft to the upper deck near the funnel, Diagram No. 6 (see footnote, page 26).

12.—Wash Places.

The provision of proper wash places for the crew has been much neglected in the past. The engineers and firemen require such provision to be made, especially after their hot and dirty work in the engine rooms and stokeholds; they require a plentiful supply of water for cleansing the person. This can be done by allotting certain space for bath and wash rooms for the sailors and firemen; baths are usually provided for officers, and these are all shown in the Diagrams Nos. 2 and 3.

For Lascars, properly situated wash places must be provided, and are shown in the Diagram No. 2. Open bathing spaces can also generally be arranged under canvas shelters, this especially in warm latitudes. The daily ablution in the case of Lascar seamen is a duty which, whilst often superficially carried out, they do not readily forego, as anyone who

knows their habits can assert. They therefore welcome any provision of this kind.

The floors of all w.c.'s, bath and washhouses, messrooms, and even forecastles, should be carefully covered with lito-silo or any similar impermeable floor covering, as the drainage can then be more easily attended to.

13.—Water Supply and Filters.

The incidence of enteric fever and dysentery is high amongst seamen in certain parts of the world; e.g., the great Lakes of North America, and the Rivers Amazon and Plate, and the problem of a pure water supply and its storage on shipboard is of great importance.

The supply of water for ships taken from town mains is usually very good, but water obtained from the iron tanks of water boats which have obtained their supplies from rivers along whose banks small villages are situated, as in the rivers and localities above mentioned, is always of doubtful character.

The type of receptacle for storing water on small boats, such as canal boats, is a cask. It is usual to find it carefully pitched inside; this preserves the wood, and provided the water is regularly and frequently changed, and the cask cleansed, very little exception can be taken to this method of storage.

On coasting boats the cask is large, and it is not always so carefully treated internally to preserve it, and these frequently decay and rot; they are therefore unsuitable on vessels larger than canal boats.

Small galvanized iron tanks cemented internally should be installed, with a manhole for cleansing purposes.

It will be necessary to have an auxiliary means of sterilising the water, and the only satisfactory type, serving all purposes, but the water must be under pressure, is the earthenware filter candle, such as the Pasteur-Chamberland.

Evaporators are now in use in all ocean-going vessels, producing a very satisfactory drinking water from salt water. The chief disadvantages are the corrosion of the pipes of the evaporating installation, and the water being unpalatable, or flat, for drinking purposes, due to insufficient aeration.

14.—Hospital.

The provision of a hospital or isolation accommodation for infectious cases has been recognised by sanitary authorities for many years as of great importance. The occurrence of cases of infectious illness on shipboard, such as smallpox, enteric fever, etc., renders it a most urgent matter. The provision of a hospital on all large sea-going vessels must therefore be strongly urged—a small room suitable for this purpose which could be converted when occasion offered, or which could be permanently allotted to this purpose. This is an important point to consider in the future planning of ships. It might be provided in the fore part of the ideal ship, well isolated from the crew's quarters aft, and yet not in an exposed situation (Diagrams Nos. 1 and 3). It could be provided with accommodation for two or four persons. The bunks would be of iron as previously described, and in the room also would be a table, lockers for linen, and medicine cupboard. A hinged framework fitted as a washstand would be useful for washing purposes, etc., and a commode with bucket attachment should be placed in the room; where a steam radiator is not provided, a stove may be utilised to heat the hospital.

15.—Storage of Vaccine Lymph.

It appears desirable to make some provision for the preservation of vaccine lymph on board vessels.

It is well known to ship surgeons and others that vaccine lymph rapidly deteriorates on shipboard, especially when the vessels pass through tropical climates, with the result that when smallpox breaks out on board, as it not infrequently does, the lymph is absolutely useless to protect the remainder of the crew or passengers. It is well known that vaccine lymph will keep indefinitely when preserved at temperatures below the freezing point. Temperatures below the freezing point could be easily obtained on board most of the larger vessels, where some form of cold storage is installed for various purposes.

16.—Mosquito Screening.

Vessels trading in the tropics, e.g., West Africa, River Amazon, Gulf Ports, etc., should be fitted with appliances to guard against the entrance of mosquitoes into the living quarters. These insects in certain specified areas can transmit malaria and yellow fever. There are

mosquito-proof frames suitable for attachment to portholes, and mosquito-proof double doors so made that they close automatically by means of a spring. In the case of doorways, the permanent door is removed before the temporary mosquito-proof doors are fitted.

17.—Disinfecting Apparatus.

In addition to a hospital, a small disinfecting apparatus should be provided for the disinfection of bedding and clothing of patients who have suffered from infectious disease. This has already been done in the case of some large vessels, but there can be no doubt that a small disinfector of a suitable type would prove generally useful.

It is impossible to describe the many types of vessels and sanitary conditions to be found on them which require improvement, but in the foregoing review all the more important points which require attention have been referred to, and what appear to be model types of improvement have been described.

A series of seven diagrams illustrating the previous suggestions will be found at end of the Report.

SUPERVISION OF FOOD IMPORTATIONS.

The Regulations governing the inspection and admission of foodstuffs into this country were issued by the Local Government Board of England in 1908 and 1909, the former year initiating the general and systematic inspection throughout England and Wales.

The Foreign Meat Regulations deal with certain classes of meats which, although, as far as one can judge, are perfectly sound, yet it is undesirable to allow to enter this country. Such meats, as scrap meat, trimmings, etc., may be derived from diseased or unhealthy animals, and it is clearly necessary to classify meats so as to sort out undesirable kinds and prevent their importation. This classification has been made by these Regulations, and only the perfectly wholesome varieties, and those which bear the official meat inspection stamp can be admitted.

Under the Unsound Food Regulations, full powers are given to deal with meats and food which may be found to be unsound or unwholesome. There are three methods of disposal of such unsound products.

Firstly, the food may be so obviously bad that no further examination may be necessary, and the importers or owners may voluntarily remove the unsound food for immediate destruction under the supervision of the Port Sanitary Authority's Officials.

Secondly, the food may be of such a nature that some consideration must be given to its industrial utilisation, and accordingly arrangements are made with the importer or owners to have these foods removed to premises, where, under the supervision of the Medical Officer of Health, the foodstuffs may be properly utilised for many industrial purposes.

Thirdly, provision is made, in cases in which some difference of opinion has arisen as to the condition of the goods or their disposal, that an application should be made to the magistrate for his adjudication.

These Regulations have been strictly carried out in the Port of Liverpool, and everyone, both amongst officials and importers, has endeavoured to meet the circumstances of each case from a broad view point; in this way the working of the Regulations during the past eight years has been carried out in a most harmonious manner. This is certainly remarkable, considering the enormous quantities and value of the foodstuffs imported at Liverpool.

The number of the permanent food staff has remained at the same figure as last year, the war conditions still claim several of our inspectors, but by temporary assistance and co-operation with the City staff, this trying war-time has been or will be tided over.

The entire meat production of Australia and New Zealand, and a large proportion of River Plate was taken over by the Government, chiefly for Army requirements.

The limited amount of freight available had an important influence on the supply of South American chilled and frozen mutton and lamb. To make up for this shortage, the advance in the home production of beef and mutton was very marked, the totals were 2 per cent. above those of 1915, and in regard to cattle were the highest ever recorded.

* For the information and figures quoted we are indebted to the "Review of the Frozen Meat Trade," published by Messrs. Weddel & Co., Ltd.

The estimated supply of home killed and imported beef, mutton and lamb together was 1,677,548 tons, or only 150,000 tons less than in 1913, the heaviest year recorded. It is evident, therefore, that the nation, as a whole, is eating as large a quantity of meat as in times of peace.

The large numbers of refrigeration steamers at present afloat cannot be used to the full extent for importing meat, owing to army transport requirements, accidents, delays, etc.

During 1916, a considerable number of vessels landed prize cargoes, these consisted of pickled beef, pork, tongues, dried apples, prunes, figs, canned beef, beans, bacon, cocoa, sardines, butter, oranges, etc., etc. The goods were examined by the food inspectors in the usual way.

Owing to delay in having prize cargoes released, and the consequent deterioration in condition and value, the matter was reported to the Admiralty through the Local Government Board, with the result that the release has been expedited, and in some cases the goods have been sold immediately by public auction.

A number of food cargoes landed in the Port have been damaged by sea water caused by acts of war, large quantities of the foods have, however, been saved owing to insistence upon the immediate drying and sale of the goods.

Several large consignments of canning beef, of a plain character without much fat, have been landed from the U.S.A. and Canada. This meat was perfectly sound, and was passed after examination by the food inspectors.

A few consignments of canned lunch tongue and pork arrived from the United States, bearing the label "second grade, sterilised lunch tongue," and "second grade, sterilised corned pork." Communications passed between the local authorities and the Government department concerned regarding this class of meat, and the Liverpool Provision Trade Association guaranteed that no further shipments of this meat would be imported into this country.

Large consignments of liquid eggs have arrived from China, these have been landed in a satisfactory condition.

Several cargoes of canned compressed corned beef have been brought to Liverpool from South America, and the percentage of blown and burst tins has been high, and some improvement in this class of meat is desirable. Large quantities of this meat have been utilised for pig and poultry feeding.

Condensed milk usually arrives in good condition, but several consignments have had a number of tierces of this milk in a highly fermenting condition, this fermented milk was allowed to be utilised for poultry feeding under suitable supervision.

Large quantities of canned and fresh or other fruit have been dealt with during the past year, chiefly bananas and oranges. Australian pears have been imported, and a large quantity have been destroyed, the general opinion is that this fruit is too soft to be able to be shipped from such a distance.

The quantities of unsound meats dealt with during the year 1916 have been much less than during previous years (except 1913), being 103 tons 16 cwts., 4 tons 10 cwts., and 1 ton 14 cwts., respectively, of beef, mutton, and pork.

The number of pieces of beef offal (hearts, kidneys, livers, etc.), however, has been higher than the previous year, and that of pork and veal less.

The causes of unsoundness of meats were chiefly due to decomposition, brine damage, or mouldiness; actual disease or emaciation, dropsy, etc., accounted for only a small proportion.

The livers, tongues, hearts, and other edible portions, included under the term "offal," were rejected for various reasons, notably decomposition, or cysts, tuberculosis, or inflammation.

Utilisation of Unsound Meat, Fruit, Offal, etc.

As previously referred to, large quantities of unsound meats (fresh, frozen and canned), fruits, cereals, etc., are dealt with by the food inspectors under the supervision of the Medical Officer of Health.

Apart from diseased conditions, all degrees of unsoundness may be met in examining imported foods.

Where meats or other foods are slightly damaged, and are unsightly, unmarketable, or even partially unwholesome, it is the usual practice to allow these goods to be removed to a suitable store or warehouse, where they may be washed, dried or trimmed under supervision, so that dirty or mouldy portions may be removed. Where decomposition is revealed in such meats, &c., the portions are taken direct to large fat and fertilising works in the neighbourhood, where they are utilised for industrial purposes, such as tallow rendering or manure manufacture.

The same procedure is adopted in the case of goods damaged by seawater, where it is ascertained that various undesirable substances forming the cargo have contaminated the foods; e.g., the washings from salt hides, metallic or other poisonous substances which have percolated into the cases.

Where a cargo of dried fruit, grain, coffee, cocoa, rice, beans, etc., has become damp, it may quickly become mouldy, fermentation turning it sour and forming an evil-smelling mass. To avoid such results it is always our endeavour to expedite the salvage of the goods, and the first desideratum is to get the grain, coffee or other material, dried as quickly as possible, and when dry, the material can then be sorted and consideration given as to its suitability for human food or for industrial utilisation. The main point, however, in all these cases is expedition in the early stages of the work.

Damaged grain may be utilised for size-making, paste, poultry or animal food.

Dried currants, prunes, and fruit of various sorts after damp conditions are frequently found to be mouldy, and the sorting and removal of mouldy portions are necessary.

It is the universal practice to destroy unsound canned meats, such as beef and mutton, but it has been recently demonstrated that these goods can be usefully made into a poultry food. Accordingly, of late, such blown tins have been forwarded to a firm in the country for pig and poultry feeding. Suitable plant has been erected to deal with the meat, and the whole plant and process has been inspected by the Medical Officer of Health and remains under his supervision.

The method has proved to be satisfactory and is a useful one for the purposes named. The owner satisfies the Medical Officer of Health that no portion of these goods is used for human food. The procedure is as follows:—

Twelve tins (72 lbs.) are opened and the meat taken out; it is placed in a boiler and cooked for one hour. The meat is now placed in a press and compressed into a firm mass (42 lbs.), the liquid jelly and fat running out into a receiver underneath.

The pressed meat is shredded and dried in ovens; after drying it is ground fine, mixed with meal and used for animal food. The fats are utilised for soap and candle-making.

It is inadvisable to allow this food to go to any place unless a suitable plant is provided to deal with it.

Tierces and tins of unsound condensed milk when fermented and blown are utilised, under a guarantee of the buyer to the Medical Officer of Health, for poultry feeding, being boiled one hour before mixing with the ordinary fowl food.

Where meats, such as beef quarters, mutton or pig carcasses, or animal offal (hearts, kidneys, livers, &c.), are found to be unsound or unwholesome owing to disease, putrefaction, etc., they are either surrendered to the Authority for destruction, this course being provided for by the Public Health (Unsound Food) Regulations of the Local Government Board, and the meat is utilised for industrial purposes at one or other of the large manure manufacturing and fat rendering firms in the City or neighbourhood; or, where a difference of opinion has arisen, or in the opinion of the Medical Officer of Health it is desirable, an application is made to the Magistrate for the suitable disposal of the meat or food. This is usually followed by the treatment alluded to above. It is only on rare occasions, therefore, that the meat or food is totally destroyed.

The meats, offals, etc., are usually treated in digestors with sulphuric acid, and the residue, thoroughly dried, is sold for manurial purposes.

Fish, poultry, rabbits, fruit, &c., are usually taken to the Liverpool Corporation manure wharf, where they are mixed with other organic refuse and prepared for manure, which is ultimately distributed by barge to farmers in the country generally.

TABLE 8.

SHOWING THE VALUE OF THE IMPORTS OF MEATS (EXCEPT
POULTRY AND GAME) INTO THE PORT OF LIVERPOOL
DURING THE YEARS 1913, 1914 and 1915.

Description.	Years.		
	1913.	1914.	1915.
	£	£	£
Bacon	4,668,201	4,911,657	10,719,819
Beef, fresh and refrigerated ...	7,847,284	9,018,097	11,378,711
Beef, salted	51,103	32,765	70,777
Hams	1,874,527	1,990,101	3,383,667
Mutton, fresh and refrigerated...	2,953,843	2,939,483	2,443,754
Pork, fresh and refrigerated ...	35,851	39,012	324,167
Pork, salted	56,617	54,939	71,083
Rabbits	299,271	304,110	159,215
Unenumerated fresh, refrigerated and salted... ..	491,123	570,894	801,044
Preserved, otherwise than by salting	801,377	975,781	1,941,040
Totals	£19,079,197	£20,836,839	£31,293,277

TABLE SHOWING THE QUANTITY OF UNSOUND MEATS
SUPERVISED AND UTILISED DURING THE YEARS 1910 to 1916.

TABLE 9.

Year.	Beef.				Mutton.				Pork.			
	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.
1910.....	381	11	0	5	15	3	1	26	54	3	3	27
1911.....	659	10	2	24	18	7	0	13	65	4	2	20
1912.....	684	8	3	0	475	12	1	2	9	12	3	18
1913.....	88	0	3	12	76	16	0	13	1	4	2	15
1914.....	441	5	2	0	47	5	2	2	1	5	0	2
1915.....	221	7	0	10	23	14	0	4	2	8	3	21
1916.....	103	16	0	13	4	10	0	24	1	14	1	16

TABLE SHOWING THE QUANTITY OF UNSOUND OFFAL
SUPERVISED AND UTILISED DURING THE YEARS 1910 to 1916.

TABLE 10.

Year.	Beef.	Mutton.	Pork.	Veal.
1910.....	13,388 pieces.	28,319 pieces.	13,845 pieces.	4 pieces.
1911.....	32,816 „	56,596 „	8,629 „	1,070 „
1912.....	68,272 „	57,163 „	8,229 „	196 „
1913.....	28,055 „	66,705 „	12,946 „	64 „
1914.....	36,561 „	41,298 „	1,919 „	44 „
1915.....	55,219 „	185,551 „	5,644 „	233 „
1916.....	63,900 „	126,110 „	2,765 „	15 „

TABLE SHOWING QUANTITIES OF UNSOUND GENERAL FOOD
STUFFS SUPERVISED AND UTILISED DURING THE YEAR 1916.

TABLE 11.

Description.	No. of Tins.	Weight in Pounds.	Description.	No. of Tins.	Weight in Pounds.
Canned Goods—			Beef	56,776	338,700
Apricot Pulp ...	1,334	13,199	Ox Tongues ...	17	102
Peaches ...	5	100	Pork	1	6
Pears	2,735	3,447	Hams	57	684
Pineapples ...	23,588	26,815	Salmon	76,867	76,664
Tomatoes ...	12,072	36,666	Lobster	93	81
Milk	33,619	31,387	Jam	324	324
Egg Pulp ...	209	7,944	Sundries	39	24

TABLE 11--continued.

Description.	Packages	Weight.				Description.	Packages	Weight.			
		Tons.	Cw's	Qrs.	lbs.			Tons.	Cw's	Qrs.	lbs.
Fruit (Fresh)—						Vegetables—					
Apples	1233	51	13	1	14	Potatoes	125	5	2	—	6
„ loose ...	—	2	7	2	12	„ loose	—	1	1	1	8
Bananas	13493	535	3	1	7	Turnips	400	20	—	—	—
„ loose	—	29	15	1	16	„ loose	—	—	18	—	—
Grapes.....	667	11	18	1	6	Onions.....	5621	271	10	1	7
„ loose	—	2	19	2	18	„ loose	—	8	10	2	—
Melons.....	255	11	4	—	12	Tomatoes	2178	39	9	—	8
„ loose ...	—	1	12	1	2	„ loose	—	4	14	1	6
Lemons	174	8	7	2	—	Cereals—					
„ loose ...	—	1	14	2	4	Wheat	—	1764	17	2	15
Oranges	5838	464	1	1	10	Rolled Oats ...	133	16	2	2	12
„ loose	—	154	8	1	18	Flour	—	—	2	—	26
Pears	2022	63	17	1	20	Barley	—	163	17	—	—
„ loose ...	—	2	3	2	12	Peas	—	—	3	—	17
Pomegranates... (loose)	—	7	9	1	6	General—					
Pine Apples ...	207	3	15	3	20	Bacon	—	5	—	—	15
Chesnuts	269	8	13	3	—	Hams	—	—	11	2	20
Cocoanuts	65	2	6	3	—	Cocoa	71	6	14	—	—
Fruit (Dried)—						Coffee Beans ... (loose)	—	1	—	—	—
Prunes.....	30	—	3	3	—	Rabbits	—	—	13	1	4
Apples	5	—	—	3	16	Fish	—	2	2	3	26
Raisins	130	4	2	2	21	Oysters	25	2	15	3	6
„ loose ...	—	—	6	2	17	Milk.....	25	6	7	3	2
Currants	275	8	8	2	1	Eggs, single ...	7024	—	5	3	—
„ loose...	—	3	2	3	10	Egg Albumen...	20	3	13	—	—
Almonds	38	3	—	—	—	Palm Kernels...	—	1	6	3	24
„ loose...	—	—	1	1	—	Cheese	12	—	—	—	12
Figs	4551	122	—	3	16						

TABLE SHOWING THE QUANTITY AND DESCRIPTION OF UNSOUND MEATS SUPERVISED*
DURING THE YEAR 1916.

TABLE 12.

Description.	TOTAL WEIGHT.		CAUSE OF DESTRUCTION.					
			Tubercular.		Brine Stained, Mouldy and Decomposed.		Other causes. (Emaciation, Dropsy and Pleurisy).	
	Tons	cwts.	qrs.	lbs.	Tons	cwts.	qrs.	lbs.
Beef	103	16	0	13	0	0	1	18
Mutton.....	4	10	0	24	—	—	—	—
Pork	1	14	1	16	0	4	0	5
Total.....	110	0	2	25	0	4	1	23
					106	4	3	25
					3	11	1	5

* These were destroyed or allowed to go for industrial purposes to the satisfaction of the Medical Officer.

TABLE SHOWING THE QUANTITY AND DESCRIPTION OF UNSOUND OFFAL SUPERVISED
DURING THE YEAR 1916.

TABLE 13.

Name of Organ.	Beef.		Mutton.		Pork.		Veal.	
	Number.	Weight, Pounds.	Number.	Weight, Pounds.	Number.	Weight, Pounds.	Number.	Weight, Pounds.
Heads	—	—	—	—	34	369	—	—
Cheeks	9,709	23,071	—	—	—	—	—	—
Tongues and Throats	3,749	24,460	84,151	40,218	90	101	—	—
Lungs...	—	—	—	—	—	—	—	—
Plucks...	—	—	25	80	—	—	—	—
Sweetbreads	2,459	823	96	12	—	—	—	—
Hearts	9,177	33,226	35,300	11,256	—	—	—	—
Livers...	3,722	39,874	26	32	2	7	—	—
Weasands	158	380	—	—	—	—	—	—
Stomachs	1,933	23,046	—	—	2,374	3,155	—	—
Skirts...	24,009	27,498	—	—	—	—	—	—
Kidneys	4,508	3,713	6,512	646	—	—	15	10
Udders	1,045	5,500	—	—	—	—	—	—
Shins	84	360	—	—	—	—	—	—
Tails	3,347	5,939	—	—	125	100	—	—
Shanks	—	—	—	—	140	560	—	—
Totals	63,900	187,890	126,110	52,244	2,765	4,292	15	10

The organs dealt with above were rejected for various reasons, notably, decomposition and diseased conditions, such as Cysts, Tuberculosis, Inflammation, Actinomycosis, &c.

TABLE 14.

TABLE SHOWING THE TOTAL QUANTITIES OF THE
DIFFERENT UNSOUND FOOD STUFFS SUPERVISED
DURING THE YEAR 1916.

	Tons.	Cwts.	Qrs.	Lbs.
Beef, Mutton, Pork and Veal...	110	0	2	25
Offal (Beef, Mutton, etc.) ...	109	3	1	12
Canned Goods	239	6	3	27
Fruit and Vegetables	1,856	5	2	13
Cereals	1,950	2	2	14
General (Fish, Poultry, Rabbits, etc.)	30	11	1	25
	4,295	10	3	4

The Bacteriologist has received 18 samples and the Analyst 55 samples of food for examination during the year.

The importation of small quantities of foreign meats of Classes I. and II. still continues. These, owing to their condition or preparation, have not the usual "official certificate" attached, or may contain prohibited preservatives. There were 24 export notices served in connection with these; the meats included such articles as pork loins, head meat, scrap meat, maws, pork tripe, sausage meats, and neck ribs.

TABLE 15.

RETURN OF THE NUMBERS OF CATTLE, SHEEP, AND SWINE
EXPORTED FROM IRELAND TO LIVERPOOL DURING THE
YEAR 1916, SHOWING THE PORTS IN IRELAND AT WHICH
THE ANIMALS WERE SHIPPED.

	Cattle.	Sheep.	Swine.
Belfast	2,385	1,104	—
Cork	32,962	23,696	14,899
Drogheda	34,414	44,803	3,649
Dublin	91,309	168,573	18,172
Dundalk	44,566	72,253	23,710
Londonderry	4,557	9,981	903
Newry	11,441	19,291	952
Sligo	187	7,607	10,174
Waterford	48,095	30,514	11,939
Total	269,916	377,822	84,398

TABLE 16.

RETURN SHOWING THE TOTAL NUMBERS OF THE SEVERAL
KINDS OF CATTLE, SHEEP AND PIGS EXPORTED FROM
IRELAND TO LIVERPOOL DURING THE YEAR 1916.

CATTLE.	No.	SHEEP.	No.
Fat	210,870	Fat	173,664
Stores (for fattening)	47,812	Stores	443
Milch Cows	5,868	Lambs	203,715
Springers	—		
Other Cattle	4,282	Total Sheep	<u>377,822</u>
Calves	1,084		
Total Cattle	<u>269,916</u>	PIGS.	
		Fat	82,279
		Stores	2,119
		Total Swine	<u>84,398</u>

TABLE 17.

Showing comparative Value of the more important Food Stuffs imported at the principal Ports during the year 1915.

	London. 1	Liverpool. 2	Hull. 3	Bristol. 4	Glasgow. 5	Manchester 6	Leith. 7	Newcastle. 8	South- ampton. 9	Harwich. 10
	£	£	£	£	£	£	£	£	£	£
Animals	134,307	—	18,082	—	—	—	—	—	36,924	—
Butter	10,460,687	471,505	2,764,361	112,329	167,398	517	2,309,733	3,275,829	2,421,815	27,938
Cheese	6,901,940	1,635,688	130,725	1,087,036	482,430	221,046	200,399	14,646	235,190	106,338
Cocoa	3,571,360	3,628,928	—	111,012	—	—	—	—	63,209	264,883
Coffee	3,526,142	782,658	—	232,953	—	—	—	—	1,056	—
Grain	30,569,442	22,335,433	12,016,892	8,641,719	6,250,689	6,781,348	3,817,182	1,506,089	201,174	—
Eggs	2,512,234	853,565	1,080,178	13,664	366,440	186,228	760,251	415,330	—	138,311
Fish	2,335,426	3,193,138	611,741	44,828	—	—	181,452	346,728	2,926	217,100
Fruit	7,195,243	5,205,727	536,438	1,135,237	848,840	508,209	—	153,415	270,344	1,659
Lard	1,361,855	1,554,380	749,025	486,337	248,396	833,730	—	327,208	—	—
Margarine	2,013,808	526,659	2,001,368	—	46,245	—	899,988	101,723	—	1,256,836
MEAT:—										
Bacon	2,203,623	10,719,819	3,906,599	925,520	874,049	236,565	219,612	477,770	—	—
Beef, Fresh	12,191,134	11,378,711	322,497	400,381	156,734	—	—	1,010	1,126,575	3,765
" Salted	—	70,777	—	—	—	—	—	—	—	—
Hams	685,941	3,383,667	—	68,723	925,754	174,676	—	—	—	—
Mutton, Fresh	11,107,075	2,443,754	1,034	71,797	5,907	—	—	2,500	48,793	92,457
Pork, Fresh	—	324,167	8,433	—	—	—	—	—	—	53,824
" Salted	378,371	71,083	—	—	—	—	6,749	27,683	—	—
Rabbits	702,423	159,215	—	—	—	—	—	—	—	22,408
Unenumerated	723,511	801,044	75,224	—	—	—	—	—	—	218,422
Preserved	9,017,399	1,941,040	209,025	95,140	139,374	145,284	—	—	20,695	—
Milk, Condensed	1,777,513	695,824	286,175	62,908	—	171,151	46,023	125,818	—	65,067
Poultry and Game	343,668	209,215	41,542	—	—	—	—	—	38,928	10,843
Sugar	13,239,023	8,977,871	746,188	1,565,795	1,394,579	1,397,456	798,521	79,022	83,055	11,270
Vegetables	1,542,746	1,235,050	514,175	91,562	156,963	238,777	34,889	73,856	632,696	18,217

TABLE 18.

STATEMENT SHOWING THE NUMBER OF LIVE CATTLE, &c.,
 LANDED AND SLAUGHTERED AT THE FOREIGN
 ANIMALS WHARF (BIRKENHEAD, ALFRED AND
 WALLASEY LAIRAGES) DURING THE YEARS 1904 TO
 1916 INCLUSIVE.

Year.	LANDED.				SLAUGHTERED.			
	Oxen.	Calves.	Pigs.	Sheep and Lambs.	Oxen.	Calves.	Pigs.	Sheep and Lambs.
1904	279,188	4	—	275,806	279,495	4	—	272,924
1905	276,725	5	—	160,105	276,273	4	—	163,705
1906	270,853	5	—	94,948	270,245	5	—	95,250
1907	214,061	2	—	97,688	215,821	2	—	94,714
1908	180,283	—	—	76,334	179,872	—	—	79,315
1909	148,233	2	—	8,053	147,812	2	—	8,053
1910	89,613	3	—	304	90,430	—	—	304
1911	78,232	2	—	40,338	79,215	1	—	39,314
1912	19,167	—	—	14,251	19,167	—	—	14,251
	143,114	819	69,016	335,291	140,854	810	67,586	334,880
1913	3,482	—	—	—	3,482	—	—	—
	351,276	930	104,274	449,344	90,857	174	15,498	131,241
1914	—	—	—	1,707	—	—	—	1,707
	333,115	248	65,242	357,528	171,716	121	16,876	158,562
1915	235,620	—	60,791	288,260	100,560	—	2,353	94,237
1916	270,117	2	84,509	377,753	137,346	—	2,210	134,794

Ordinary type represents Foreign. Heavy type represents Irish.

The Aliens Act, 1905.

This Act is in abeyance during the war, and all aliens landing at our Ports are dealt with by Order in Council.

EMIGRATION.

There was a further decrease in the number of emigrants leaving the Port of Liverpool during the year 1916, the number being 58,749, a decrease of 16,638 from the previous year, when the number of emigrants leaving the Port was 75,387.

The following is a return of the number of emigrants and clearances of ships, including those passenger vessels in which medical inspection was not required, from 1900-1916.

TABLE 19.

In 1900, 149,884 Emigrants, and 660 Clearances of Ships.

„ 1901, 167,452	„	761	„
„ 1902, 214,113	„	791	„
„ 1903, 265,918	„	902	„
„ 1904, 274,584	„	924	„
„ 1905, 277,536	„	983	„
„ 1906, 352,818	„	1,090	„
„ 1907, 385,797	„	1,102	„
„ 1908, 212,155	„	1,113	„
„ 1909 253,400	„	1,117	„
„ 1910 336,088	„	1,149	„
„ 1911 312,027	„	1,153	„
„ 1912 323,187	„	1,165	„
„ 1913 347,541	„	1,199	„
„ 1914 232,954	„	1,065	„
„ 1915 75,387	„	677	„
„ 1916 58,749	„	562	„

The following Tables, Nos. 20 and 21, relating to Emigration have been kindly supplied by the Board of Trade.

TABLE 20.

Statement showing the Number of Passengers of British and Foreign Nationality that left the Port of Liverpool for places out of Europe in the year 1916.

DESTINATION.	British Subjects.	Aliens.	Total.
British North America....	14,685	598	15,283
Australia and New Zealand	9	—	9
British South Africa	3	—	3
India (including Ceylon)	1,990	107	2,097
Other British Colonies and Possessions	3,583	225	3,808
Total British Empire.....	20,270	930	21,200
United States.....	24,316	10,633	34,949
Other Foreign Countries	1,934	666	2,600
Total Foreign Countries...	26,250	11,299	37,549
Grand Total.....	46,520	12,229	58,749

TABLE 21.

Number of Passengers of British and Foreign Nationality, as given in Table No. 20, that sailed from the Port of Liverpool, in each month of the year 1916.

MONTH.	British Subjects.	Aliens.	Total.
January	2,137	701	2,838
February	2,366	666	3,032
March.....	2,385	786	3,171
April	3,684	1,031	4,715
May	4,512	1,170	5,682
June	4,171	929	5,100
July	3,825	990	4,815
August.....	4,713	1,225	5,938
September	6,499	1,445	7,944
October	6,024	1,196	7,220
November	3,469	976	4,445
December	2,735	1,114	3,849
Total	46,520	12,229	58,749

Emigrant Inspections.

All emigrants travelling second class or steerage on board vessels outward bound are subject to inspection by the Medical Officers of the Board of Trade, Dr. Burland and Dr. McLean. The crews of all such vessels bound for America are also subjected to inspection by these Officers. An Inspector of the Port Sanitary Authority attends these clearances in order to supervise the removal of all persons who may be rejected on account of actual or suspected infectious disease.

There were 118 such inspections, and 19 persons were rejected on account of infectious disease.

TABLE 22.

Date, 1916	Name of Vessel.	Nature of Sickness.	Where taken to.	Description of Patient.
Feb. 11	Missanabie ...	Chicken-pox ...	Returned to Newcastle ...	Infant (1)
„ 19	Pretorian ...	Erysipelas ...	Returned to 52, Wadham Road, Bootle.	Adult (1)
April 5	St. Paul ...	Ringworm ...	Returned to Manchester...	Child (1)
„ 7	Metagama ...	Chicken-pox ... (Convalescent)	Returned to Middlesbrough	Infant (1)
„ 8	Lapland ...	Scarlet Fever ...	Removed to Netherfield Road Hospital.	Adult (1)
„ 15	St. Louis ...	Scabies ...	White Star Boarding House. 79, Old Hall Street ...	Infants (2) Infants (2) Children (2)
June 23	Grampian ...	Chickenpox ...	Boarding House ... Great George Square	Infant (1)
July 1	Philadelphia	Measles (Contact)	Returned home to Walton	Adult (1)
„ 19	Adriatic ...	Observation... Egyptian Moles ... Inflamed Face ...	White Star Boarding House. „ „ „ „ „ „	Adult (1) Adult (1) Adult (1)
Aug. 3	Philadelphia	Chickenpox ...	White Star Boarding House.	Infants (2)
„ 12	St. Paul ...	Chickenpox ...	130, Duke Street ...	Infant (1)

In addition to the reduction already mentioned in the permanent food staff, owing to inspectors having joined the colours, one of our Port Medical Staff and several from the Clerical and Sanitary Staff have given their services during the war.

As in previous years, the various bodies connected with the administration of the Port, viz., H.M. Collector of Customs and staff, the Mersey Docks and Harbour Board and their officers, and the various Shipping Companies, have co-operated with the officers of the Port Sanitary Authority in the performance of their duties, and have worked harmoniously together in every particular. The Consular Body have at all times given courteous assistance.

MUNICIPAL OFFICES,

LIVERPOOL, *19th April*, 1917.

E. W. HOPE, M.D

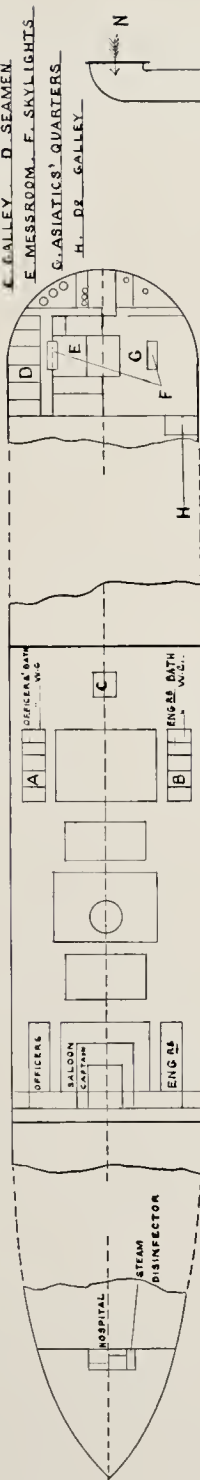
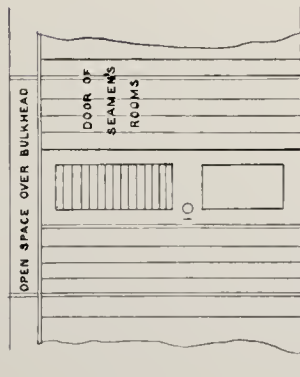
APPENDIX

SERIES OF SEVEN DIAGRAMS TO ILLUSTRATE MARINE HYGIENE

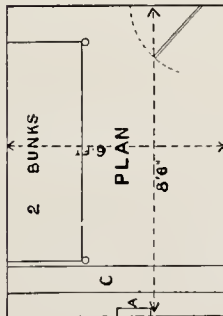
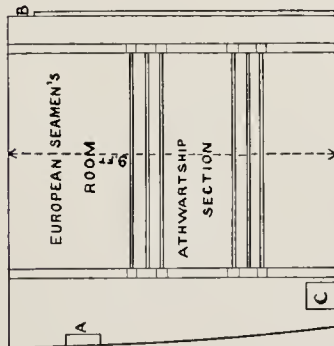
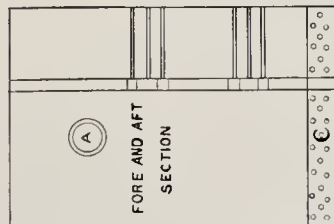
(See page 21.)

1

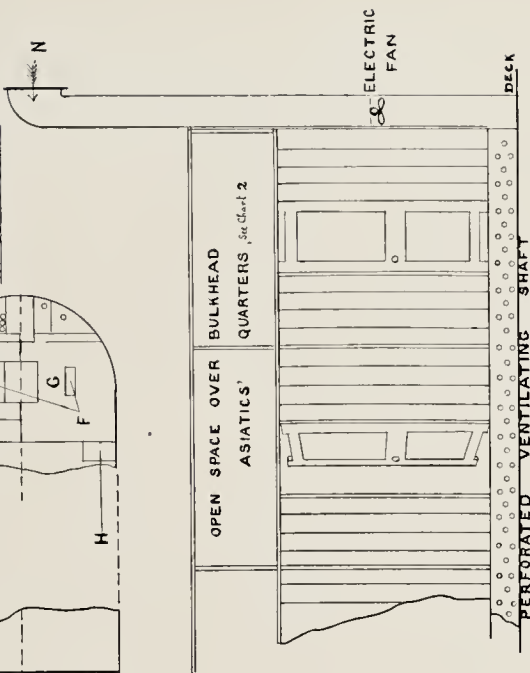
PLAN OF A VESSEL SHOWING SUITABLE DISTRIBUTION AND ARRANGEMENT OF CREW'S QUARTERS.
A HOSPITAL IS PROVIDED AT FORWARD END OF THE SHIP.



- A. QUARTERMASTERS
- B. PETTY OFFICERS
- C. GALLEY
- D. SEAMEN
- E. MESSROOM
- F. SKYLIGHTS
- G. ASIATICS' QUARTERS
- H. DE GALLEY

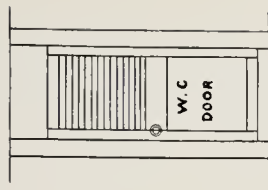
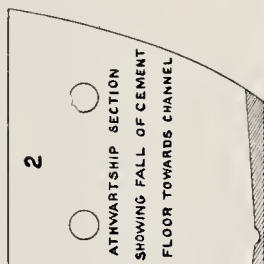
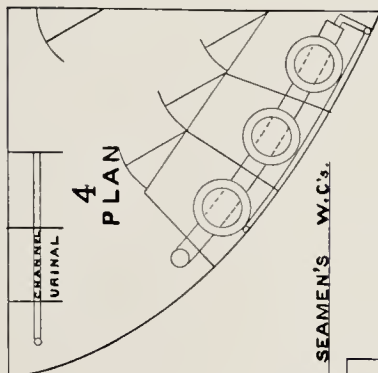
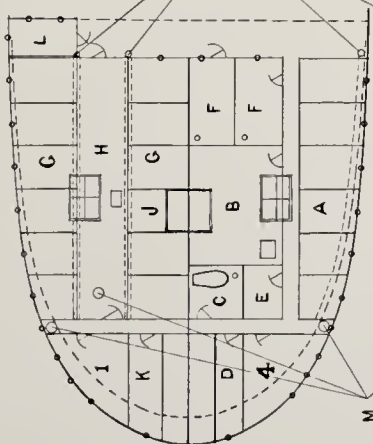


- A. PORTLIGHT
- B. VENTILATING SPACE OVER DOOR
- C. PERFORATED VENTILATING SHAFT

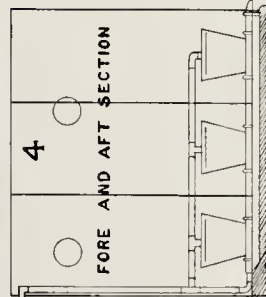
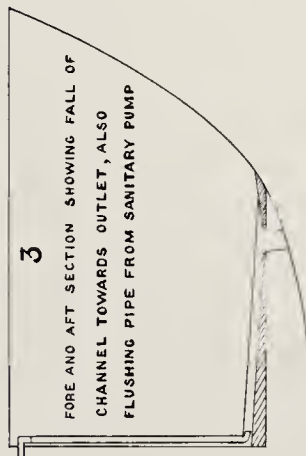


2

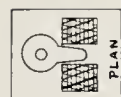
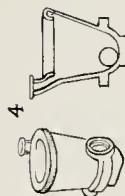
- A. EUROPEAN SEAMEN'S ROOMS
B. D° MESSROOM
C. D° BATH
D. D° WASHHOUSE
E. ROOM FOR SEA CHESTS & CLOTHES
F. STORES



1.2.3 ASIATICS' LATRINE.

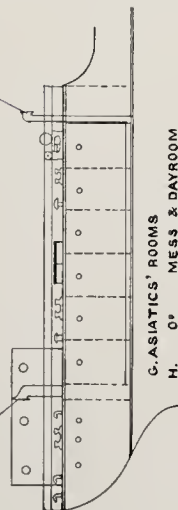


PIPE LAID SO AS TO FORM WEIR

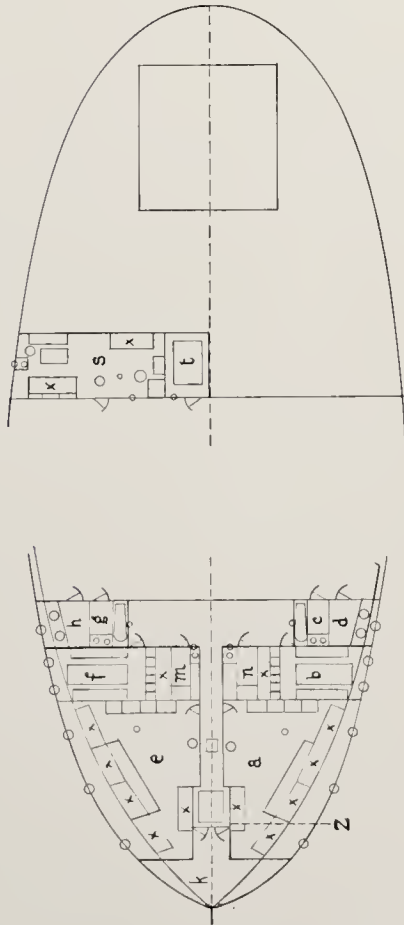
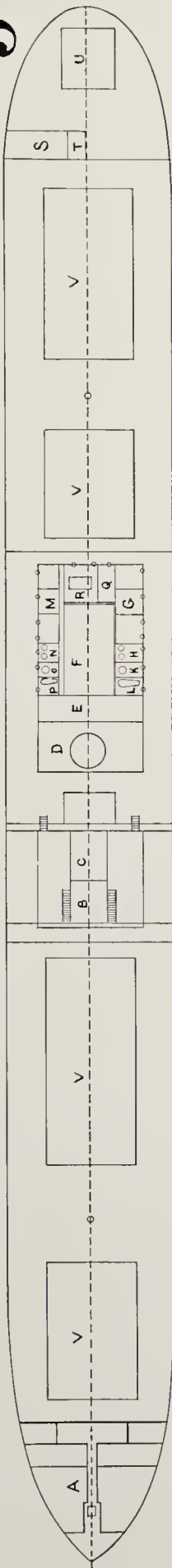


TYPE OF LATRINE FOR ASIATICS
PLAN
SECTION

- G. ASIATICS' ROOMS
H. D° MESS & DAYROOM
J. D° FOOD STORE
K. D° WASHHOUSE
L. D° GALLEY
M. OUTLET VENTILATORS
N. INLET D°



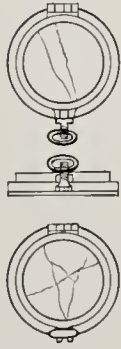
3
A. FORECASTLES. B. CHART ROOM. C. CAPTAIN. D. STOKHOLD. E. GALLEY. F. ENGINES. G. H. K. & L. OFFICERS' ROOMS, LAVATORY, W.C., & BATH. M. N. O. & P. ENGINEERS' ROOMS, LAVATORY, W.C., & BATH.
Q. CADETS' ROOM. R. ENGINEERS' MESSROOM. S. HOSPITAL. T. DISINFECTOR. U. WHEEL HOUSE. V. HOLDS.



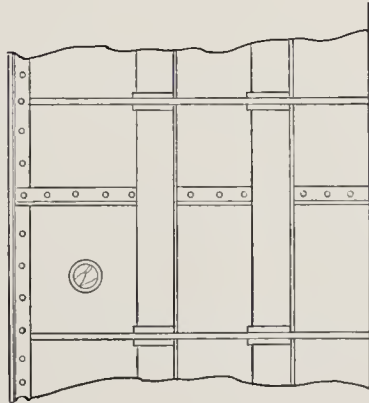
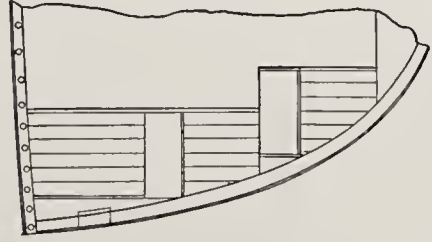
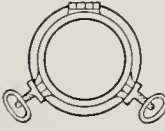
- a. SAILORS' FORECASTLE
b. D° MESSROOM
c. D° BATH
d. D° W.C.
e. FIREMEN'S FORECASTLE
f. D° MESSROOM
g. D° BATH
h. D° W.C.
i. MENS' CLOSETS
m. LEADING STOKERS
n. BOSS'N & CARPENTER
s. HOSPITAL
t. STEAM DISINFECTOR
x. BUNKS



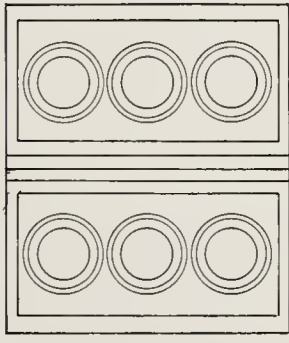
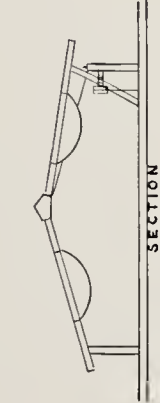
UNSUITABLE TYPE OF PORTLIGHT FREQUENTLY CRACKS AND ADMITS WATER.



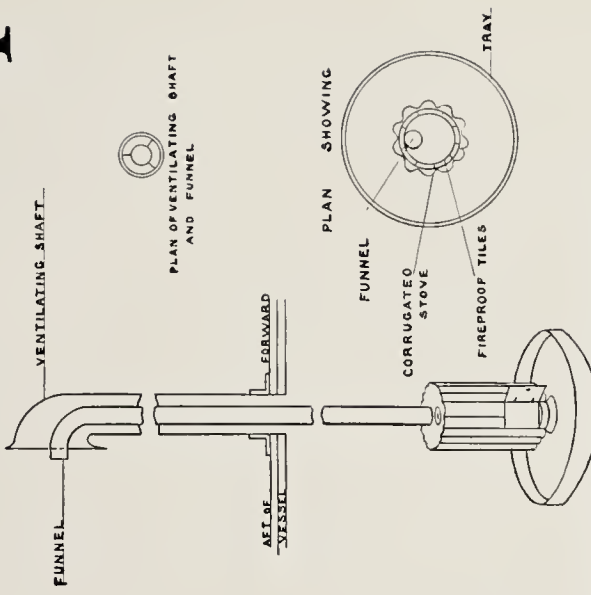
IMPROVED PORTLIGHT WITH TWO LUGS WHICH BEARS THE STRAIN OF WEATHER.



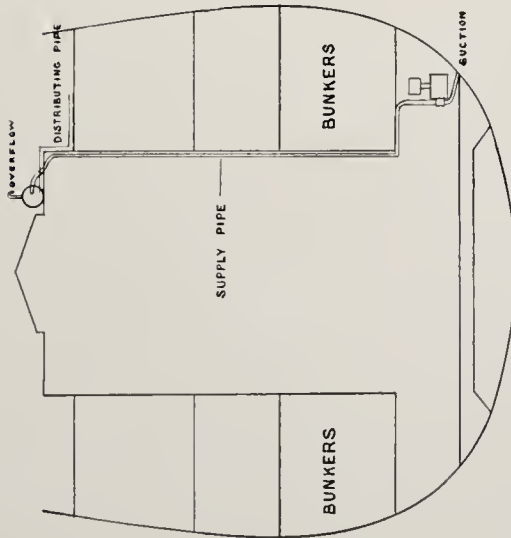
EXAMPLES OF OLD TYPE OF WOODEN BUNKS. THEY ARE BOXED IN, AND FREQUENTLY HARBOUR VERMIN; ARE BUILT CLOSE TO THE VESSEL'S IRON SIDES AND ARE DAMP AND DIRTY.



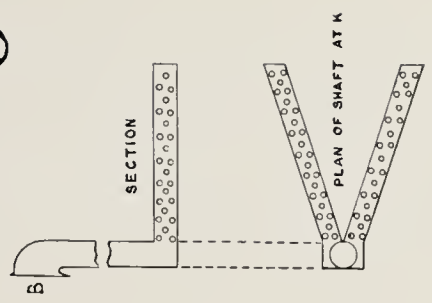
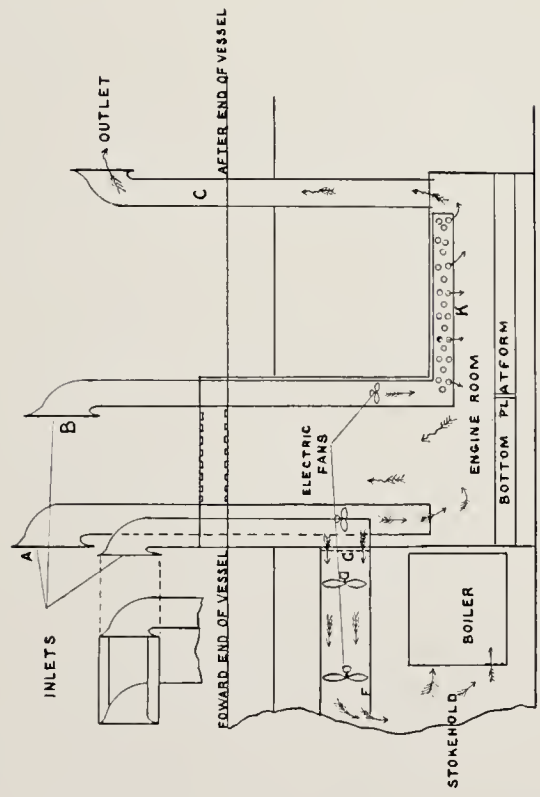
PLAN OF IMPROVED TYPE OF SKYLIGHT

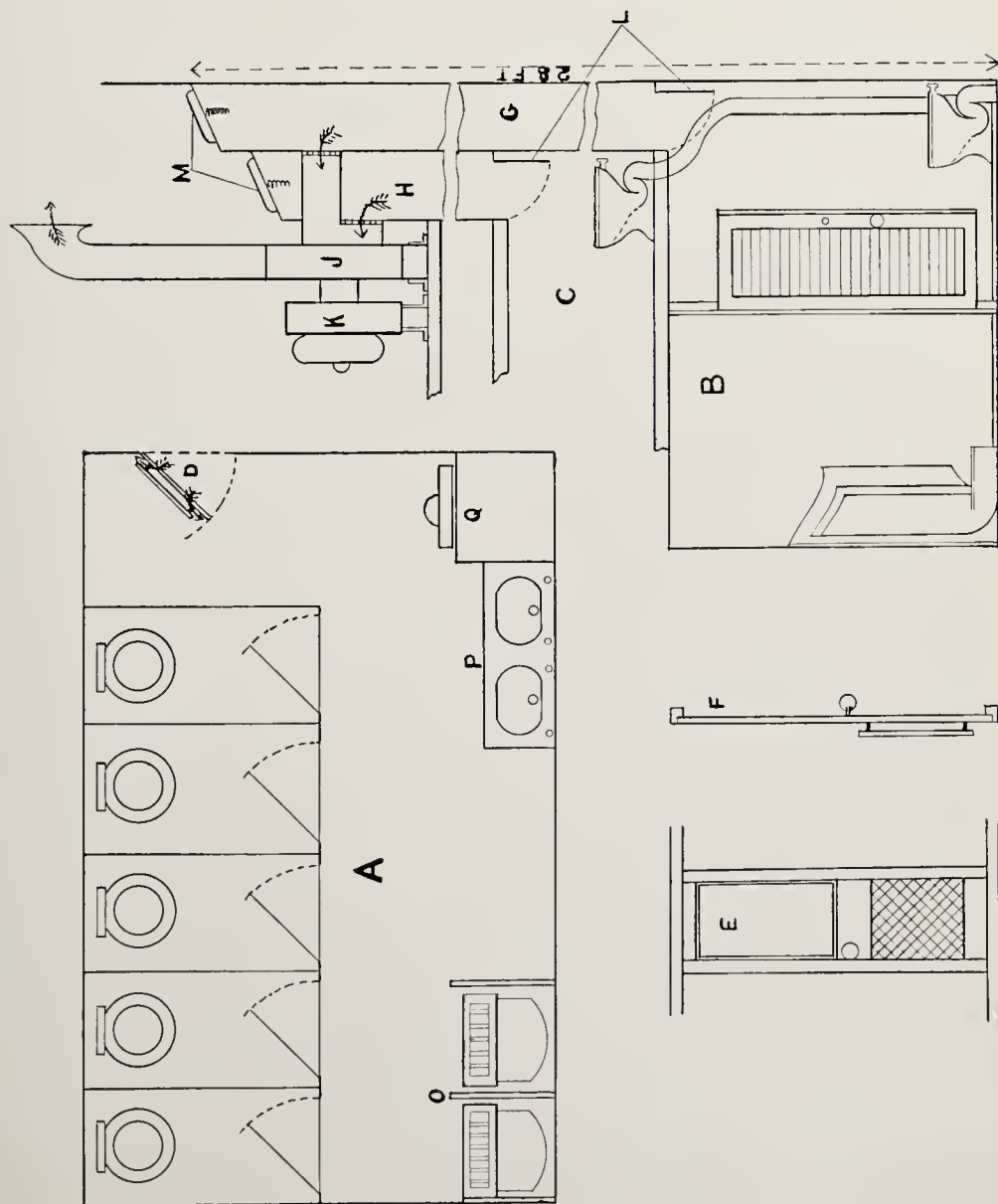


IMPROVED TYPE OF STOVE LINED WITH FIREPROOF TILES. IT HAS A COMBINED STOVE FUNNEL AND OUTLET VENTILATOR. IT IS NOT SUITABLE FOR TOP-GALLANT FORECASTLES IN SEVERE WEATHER.



SECTION OF A VESSEL FITTED WITH AUXILIARY PUMP FOR THE CONSTANT SUPPLY OF WATER FOR FLUSHING PURPOSES. CAN BE UTILISED INDEPENDENTLY OF SHIP'S ENGINES.





VENTILATION OF 1ST CLASS LAVATORIES

A. PLAN, B. SECTION, OF GENTLEMEN'S LAVATORY.

C. LADIES' LAVATORY.

D. PLAN, E. ELEVATION, F. SECTION, OF DOOR WITH VENTILATING PANEL.

G. & H. LIGHTING AND VENTILATING SHAFTS.

J. FAN. K. DYNAMO.

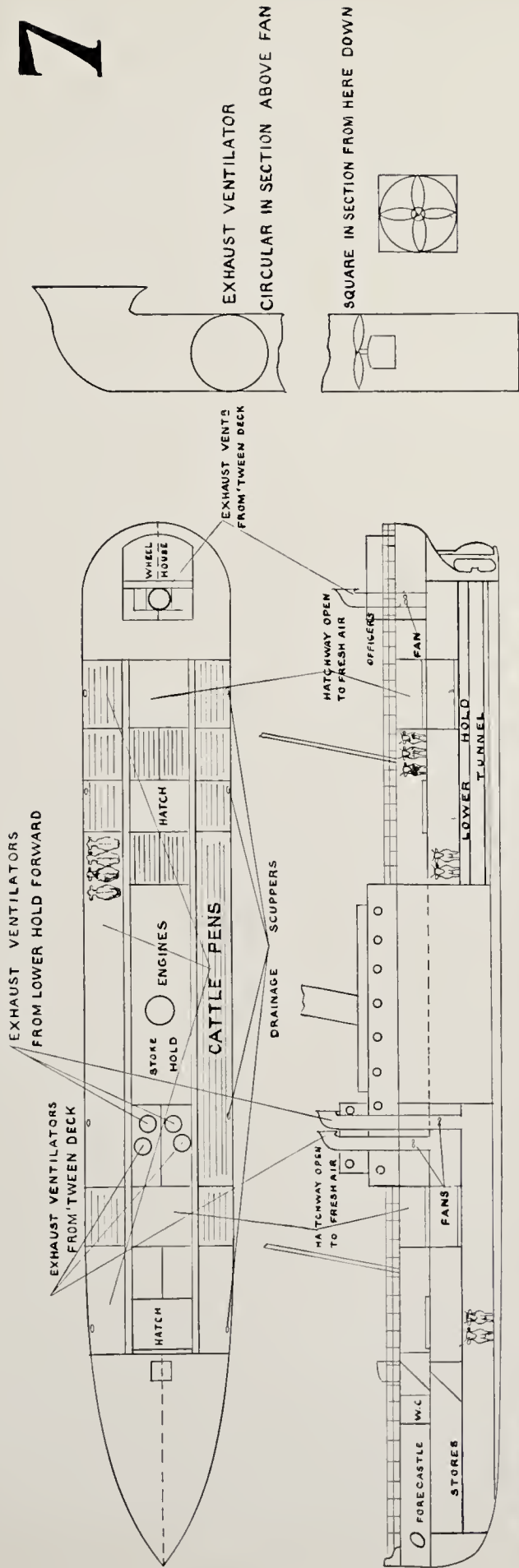
L. DROP DOORS FOR CLOSING VENTILATING SHAFTS

M. MUSHROOM VENTILATORS

O. URINAL. P. LAVATORY BASINS

Q. FAN REGULATOR & RESISTANCE COILS

7



CATTLE BOAT. LENGTH=270 FT. BREADTH=36 FT. DEPTH OF HOLD=16.5 FT.

